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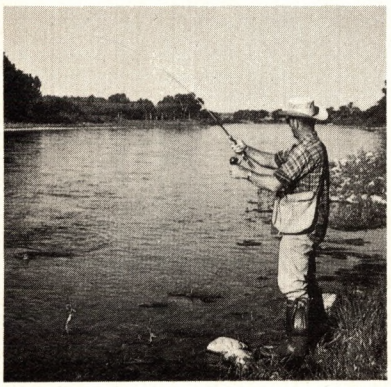

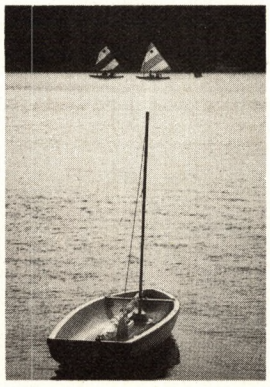

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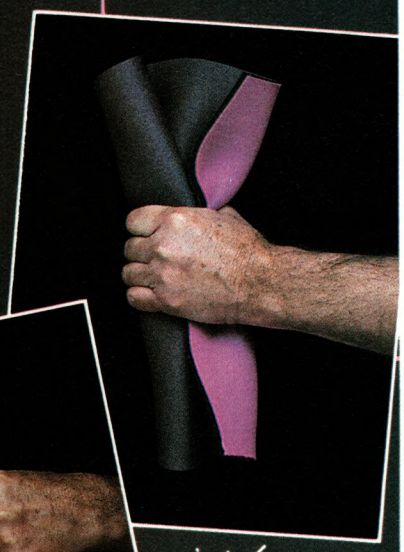

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SCUBAPRO Diving & Snorkeling

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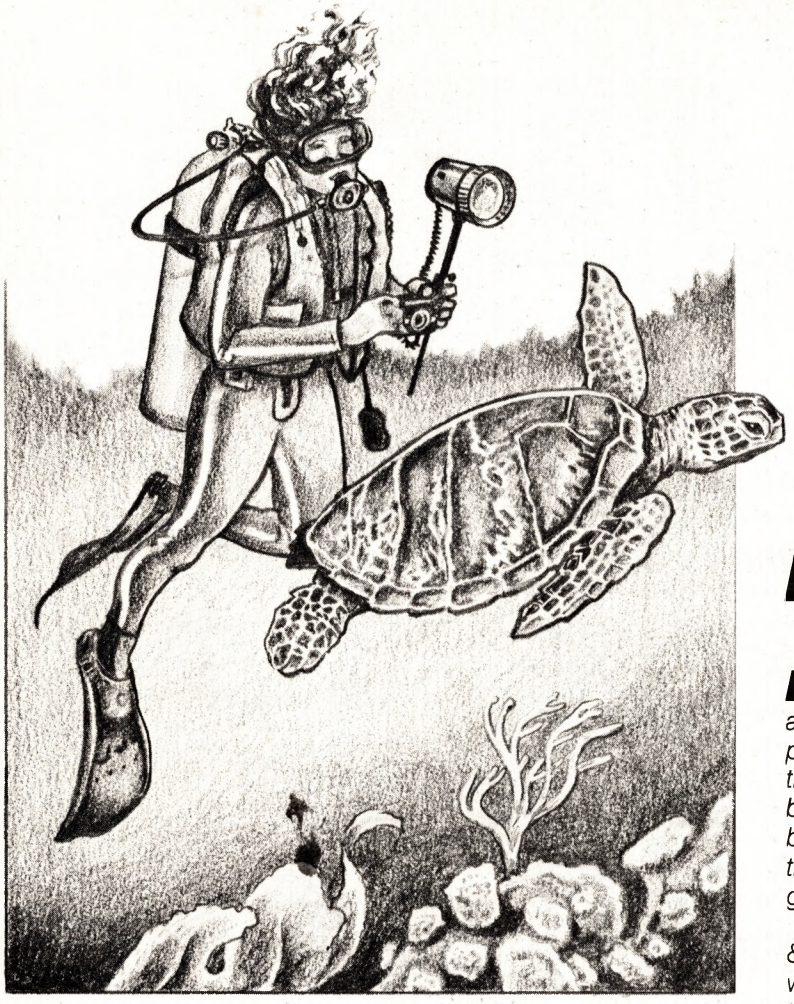

Editor's Page

Divers will find a place to dive anytime and anywhere — they're just that kind of people. There isn't a hidden lake high in the Rockies or a clear spring deep in the bayou that hasn't had its surface broken by ascending bubbles. In every corner of the country divers find enough water to get wet often enough to keep them happy.

With each issue of SCUBAPRO Diving & Snorkeling new writers develop who want to share their experiences diving in their particular part of the country. When veteran diver Jack Watson asked if we'd like a piece on the giant octopus of Puget Sound, there was no saying no. It sounded like an interesting dive and if it was a safe dive and available to people living in the Northwest or visiting there, the piece would fit in just fine. Jack's account begins on page 12.

At the other end of the country, Wendell Patton takes us along a tour of the low country, tidal rivers of South Carolina. An area rich in history, the Deep South holds a special charm steeped in anti-bellum plantation life. Its rivers are rich in artifacts from this period. "Dixie River Dive" begins on page 48.

Farther south, Tim O'Keefe introduces us to the "Other Side of Florida." Not as famous as the Keys, the Palm Beach area offers terrific diving just off the beach and all the amenities one could ask for ashore. Tim's tour of the Gold Coast begins on page 70.

Up in the Northeast, Cathie Cush details a type of diving popular in her part of the country. Inland divers discovered long ago that abandoned quarries are a lot of fun to dive. When quarriers struck water, pumps were used to keep the pit dry so work could continue. When the quarry gave out, the pumps were shut off and a future dive site was created overnight. Cathie's article begins on page 20.

Regardless of where you live, chances are there's an interesting dive within a few hour's drive of your home. As a matter of fact, I just thought of a pond at the end of a dirt road deep in the woods where someone once said there was a mill at one time. I wonder . . .

Edward Montague

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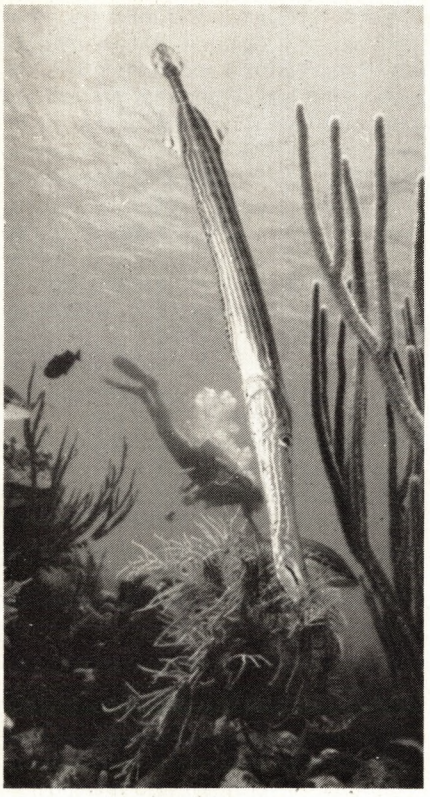
Stayin' Alive

BY NANCY SEFTON



A trumpetfish takes shelter among some corals.

Fish employ some unusual tactics to avoid predators.

To a fish, life is a world of predation. Almost every second of its existence is spent on guard, either trying to avoid capture by some larger reef resident or trying to capture a smaller one itself. Indeed, the very balance of life in a marine community is based upon this simple fact.

However, certain fishes have evolved more effective defense mechanisms to thwart their natural enemies than others. These ingenious devices continue to intrigue scientists and provide a fascinating study for sport divers.

Often, the best defense is a good offense, but this rarely applies in a coral community. Few fishes can fight back effectively if captured, so they try instead to avoid attracting predators in the first place. The most obvious form of self-defense among fishes is the act of schooling.

Far from merely socializing, fish that group together during the daylight hours usually seek safety in numbers. A barracuda confronted with a school of snappers tightly packed together into a mass of twisting silver bodies faces a problem. It's often impossible to single out an individual to attack. In frustration, the barracuda gives up and swims away to find an easier target.

Fish that school for protection also seldom do so in the open. Instead they hover against coral heads, beneath overhangs or inside caves and grottos as an additional safeguard against attack. Commonly seen on Caribbean reefs are schools of grunts, goatfish, snappers, tangs and occasionally squirrelfish.

It is not unusual to see schools composed of more than one species, fishes with similar coloration, such as grunts and goatfish. When night falls, the schools break up and the individual members disburse over the reef to feed alone in the safety of darkness.

Fish that don't school have developed a variety of clever defenses to avoid capture as they move alone or in pairs among the corals. Artful camouflage, unusual body shapes and even the ability to change color at will, are among the more successful fish defense mechanisms observable on the reef.

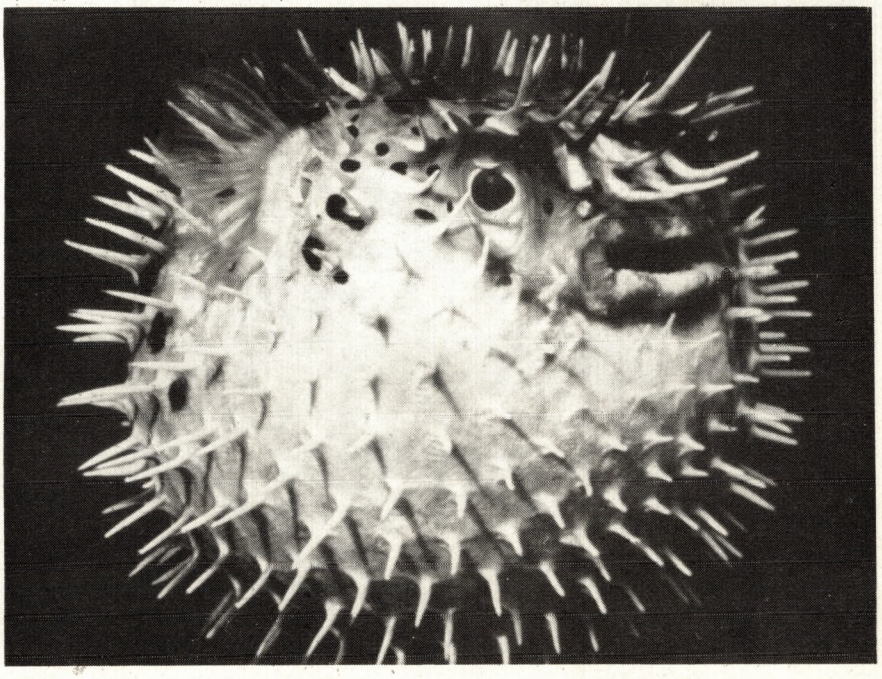
The peacock flounder, a resident of shallow reef flats, swims only when it has to, preferring to lie motionless on the sandy bottom. It is all but invisible in this position, its mottled body blending perfectly with its surroundings. When the flounder lifts off to glide away, its fins darken to a rich blue.

Many bottom-dwelling species have mottled bodies which blend into the substrate and reef rubble. Only when the fish moves can it be detected.

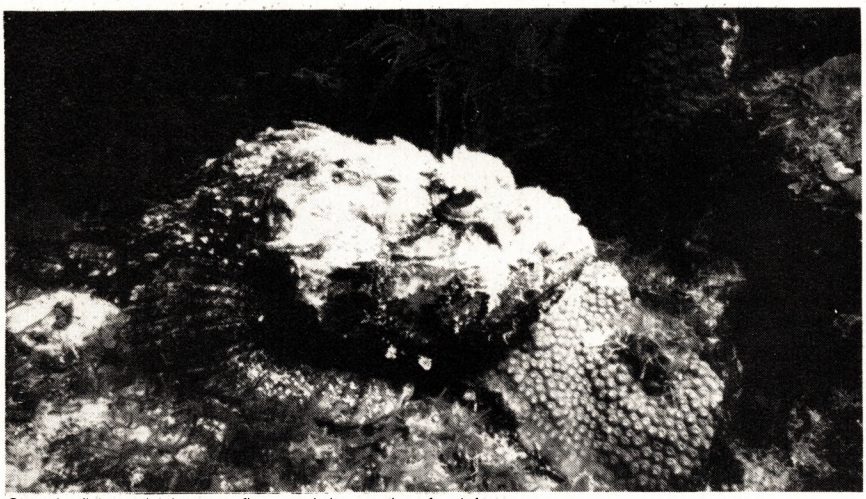
Some species use their shape to assist in hiding. A case in point is the trumpet fish with its sword-shaped body. The trumpet lives out its day disguising itself as one thing after another. It may cruise along with a school of blue tangs and acquire a bluish tinge just for the occasion. Or it may latch onto an unwilling grouper and play piggy-back over the coral gardens. Most often, it simply turns vertical alongside a soft coral formation or a tall, skinny sponge. All this may fool a predator, but for the diver it makes for a delightful sideshow and interesting photography.

When posing against corals and sponges, the trumpet is engaged in offense as well as defense. From this vantage point, it can dart out to capture its own prey which are small fishes completely unaware of its presence.

A porcupine fish inflates to ward off predators.



Nancy Sefton is a free-lance writer and underwater photographer who has lived on Little Cayman Island for the last 14 years.



Scorpionfish use both camouflage and sharp spines for defense.

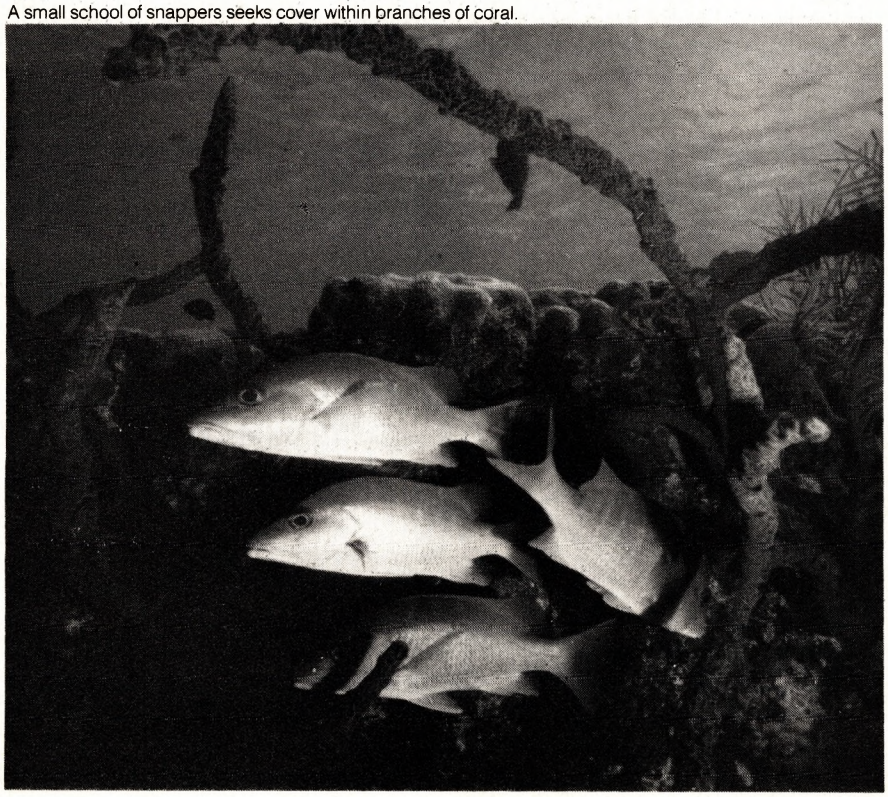
With some species, it is their body color patterns, at times rather dazzling, that make all the difference. Until recently, scientists puzzled over the psychedelic zebra stripes on such fishes as the spotted drum, jacknife and Nassau grouper. Current theories are that these patterns serve to confuse a predator. While the latter hesitates, trying to decide which end of the prey is the front end — and thus the direction the chase will take — the would-be victim has an extra second or two to escape.

Equally effective in this regard are the body patterns of the butterfly fishes. Each species sports a broad black stripe across its head, almost completely obscuring the eye. Again, a potential predator must ponder the direction of the chase before it can strike.

With hungry eyes peering from behind every coral and sponge, it seems logical the smaller, more vulnerable fish would try to maintain a low profile on the reef. On the contrary, every ocean has its rather gaudy inhabitants who seem to advertise their whereabouts with their flashy colors.

They roam at will, seemingly oblivious to the hunt. What gives them this special dispensation? Many brightly-colored fishes are quite toxic, containing a body poison lethal to any predator. It is highly likely the bright hues serve as a clear warning of fatal consequences to the foolhardy. The queen angel, French angel and rock beauty thus browse in relative safety despite the fact their colors make their whereabouts obvious.

A small school of snappers seeks cover within branches of coral.



Some fish have a unique defense system they can call upon only when needed. The porcupine and puffer fishes are good examples. When moving casually about the reef, they're rather shapeless, with broad, flat heads and bulbous eyes. If agitated, the fish opens its mouth wide and draws in water, inflating its body to two or three times its normal size. At this point its spines, which normally lay flat against the body, become erect. The end result is a most unappetizing, and somewhat dangerous mouthful.

Trunk and cow fish have an unorthodox body structure which takes them off the prey list. Just beneath the scales of these box-shaped fish is a skeletal layer of fused bony plates. This subepidermal armor is an effective deterrent.

Creatures like the stingray possess special weaponry that has given them a nasty reputation among divers. The ray sports a barb at the base of its tail, but this is actually used for defense, not offense. Rays spend their time half-buried in the sand, dredging up small organisms to feed on. If threatened, the ray may use its barb, but it is not terribly effective against its number-one enemy, the shark. Many a Caribbean stingray is minus its tail, bitten off just below the barb.

The scorpion and stone fish carry things a bit far, doubling up on their defense devices. At rest on the bottom, the fish resembles a rock. Many a heedless snorkeler has accidentally touched a scorpion and has thus become painfully aware of the creature's back-up defense — a sharp spine in the dorsal structure.

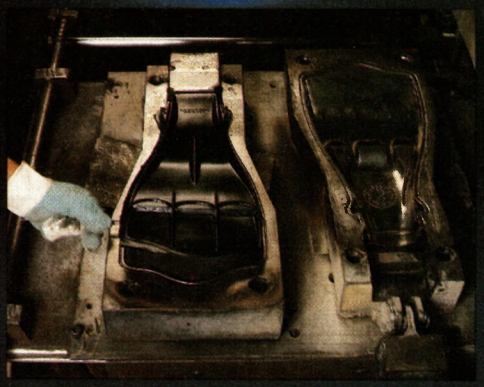
Perhaps the most intriguing method of protection is the strange association between certain fishes and anemones. The stinging cells in anemone tentacles carry a toxin that paralyzes small organisms on which the anemone feeds. Most reef fish steer clear of anemones, for the sting is powerful and even fish are a potential meal for the anemone.

However, certain species like the diamond blenny in the Caribbean and the clownfish in the Pacific have developed a total immunity to the toxin, enabling them to use the anemone for protection. The clownfish actually swims among the tentacles and, if threatened, buries itself deep within them. The diamond blenny perches upon its pelvic fins just to one side of its anemone host and leaps into the tentacles at the first sign of danger.

Scientists suspect these fishes are not born with the immunity, but rather, develop it gradually by subjecting themselves to the anemone's sting a little at a time, starting when they are juveniles.

Every fish on the reef has evolved some means of self-protection in their "fish eat fish" world. In this way, all reef creatures live, not exactly in peace, but with a reasonable chance of survival to a ripe old age. **S**

STILL THE ONE



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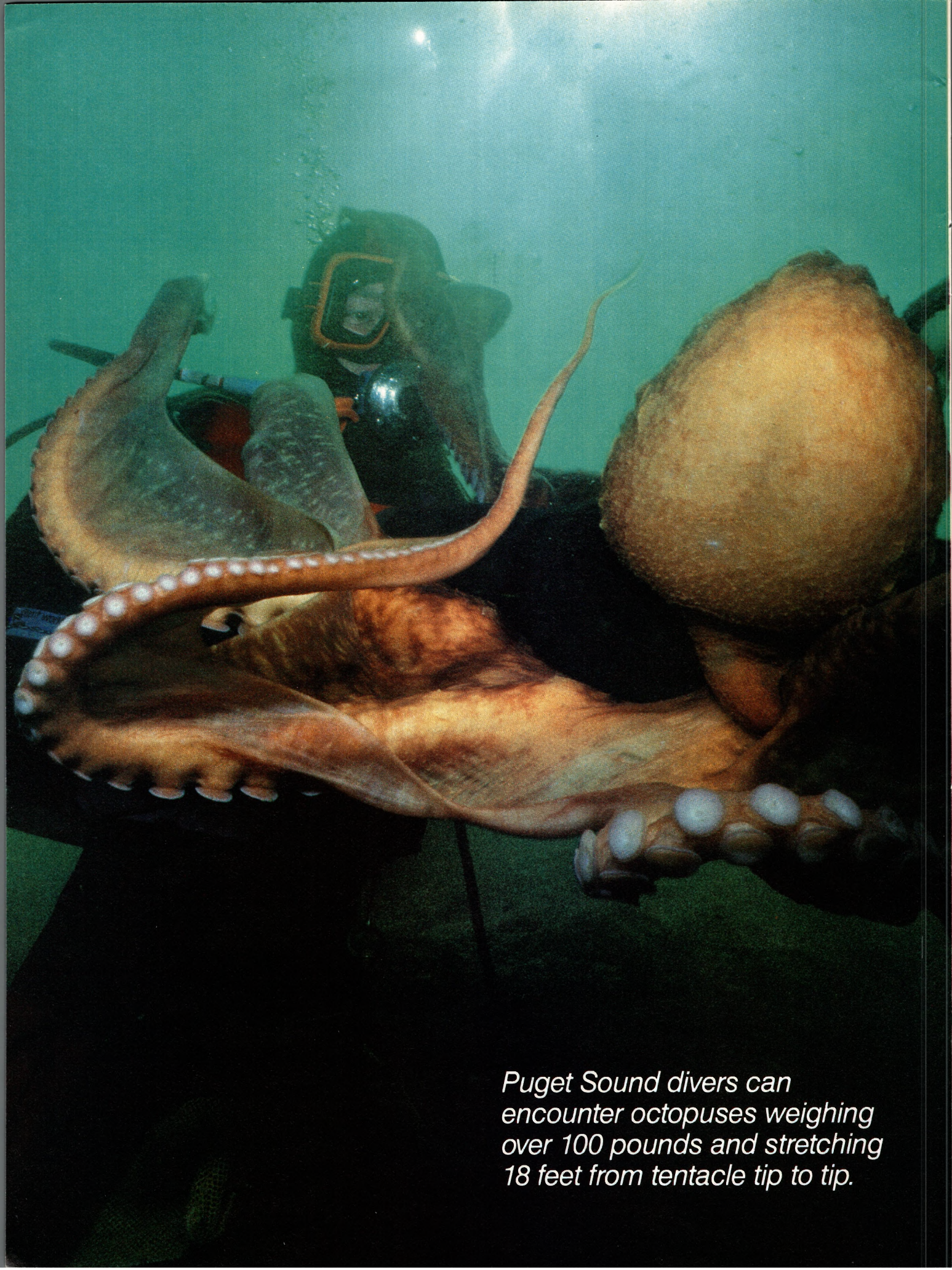

Puget Sound divers can encounter octopuses weighing over 100 pounds and stretching 18 feet from tentacle tip to tip.

One for the Gripper

Photo by Bruce O'Neill

The human appearing eyes of an octopus stared back, unblinking with no trace of emotion. Usually when I approach octopuses underwater, they close their eyes thinking perhaps I will go away if they ignore me. There was something different about this one.

My diving buddy and I had entered the water under the Tacoma Narrows Bridge just moments before. We had only snorkeled a few yards toward Salmon Beach when I caught sight of a waving tentacle tip. I jack-knifed my body and kicked down for a closer look. An average-size octopus, spanning about seven feet across, was slithering up and over the top of a large concrete slab. The bottom in this area is strewn with the skeleton of "Galloping Gertie," the first Narrows Bridge which collapsed during high winds in 1940.

The octopus seemed unconcerned when I moved in close and we looked at each other eyeball to eyeball for several seconds.

Surfacing, I floated quietly and kept the octopus in view. Suddenly it pushed off from the bottom and slowly started rising toward me. An apprehensive feeling enveloped me. I remained motionless, transfixed and almost hypnotized by the bulging eyes of the approaching creature.

The octopus came within two feet of my face mask before it stopped and hung suspended. I shook off the mesmerized feeling and told myself to grab this crazy octopus. If it was accommodating enough to come right to me, the least I could do was welcome it with open arms. After all, the Point Defiance Aquarium had requested a specimen. I reached down and gripped it with my gloved hands in the gill openings. Immediately the octopus began to writhe and jerk violently.

My buddy, Warren Gipple, came to my assistance with an open gunny sack but it was not easy to stuff something with the consistency of raw eggs and eight busy, clutching arms into the bag.

Once inside, the octopus quieted down. We swam ashore, scrambled up a steep trail to the parking lot where we had a large plastic container filled with salt water. The bagged octopus was placed inside and we drove in our wet suits to the Point Defiance Aquarium.

Later Cecil Brosseau, the director of the aquarium, told me this was the most active and intelligent octopus ever displayed at the aquarium. Brosseau was so good with octopuses he could train them to crawl completely out of the water and sit for several minutes in his lap which he covers with a moistened rubber apron.

During 28 years of diving in Puget Sound, I have studied and handled dozens of octopuses. This was the only octopus I ever saw deliberately break free from the bottom and come at me on the surface. What was the motivation? Personally, I believe it was curiosity, but my diving friends kidded me about having a sexy appeal to an octopus, even though I didn't look like much to the females of my own species.

Puget Sound is home to some of the largest octopuses in the world, weighing well over 100 pounds and stretching 17 to 18 feet from tip to tip. There also is a miniature species which only spans about six inches when fully grown. This midget was originally imported from Japan to the Point Defiance Aquarium where several specimens escaped through an outlet drain to Puget Sound. Evidently they found conditions to their liking and they proliferated throughout the Sound.

Back in the 1950's, when scuba diving was a new and unique sport in the cold Puget Sound waters, we were understandably hesitant to tangle with the maligned and misunderstood octopus. We soon discovered however, that the villain of many novels was really a rather shy and timid animal, yet fascinating to observe and study in its natural element.

Classified as cephalopods (head-footed), octopuses or octopi have their soft, boneless bodies partly covered with a mantle of skin which puts them in the Mollusca family along with the lowly snail and oyster. Personally, I feel that the octopus and squid deserve a special classification of their own because of their obvious intelligence. Certainly their behavior is much more exciting for humans to watch than that of an oyster.

Jack Watson is an avid diver who worked for the American Red Cross for many years as a water safety and YMCA diving instructor. Jack lives in the shadow of Mount Rainier.

Dive Logistics

The inland sea of Puget Sound offers good diving because storms with resulting high waves are scarce, surf is minimal, and visibility is often more than adequate, particularly in the northern part of the Sound and up into the fabulous San Juan Islands. Marine life is plentiful and fascinating.

In the Tacoma Narrows, where octopus are seen most often, visibility varies from 10 to 60 feet. Clear winter days are best for diving. During the summer, the bloom of plankton and algae often reduces visibility.

Tide tables should always be consulted because currents can race through the Narrows at six knots or better. At high slack or low slack periods, divers usually have at least an hour of still water.

The east or Tacoma side of the Narrows offers the best diving. Here rocky reefs extend from shore down to 80 feet. From the Narrows Bridge north to Salmon Beach, a distance of about a mile, the huge rocks are almost continuous.

Divers are cautioned to stay fairly close to shore and in the rocks so they can use the rocks for handholds should the tide start to run. Many years ago a group of divers got caught in the middle of the Narrows when the tide began to rip. They were tumbled and buffeted so vigorously by whirlpools and scrambled currents that they had doubts for a while about their survival.

An underwater light is helpful to explore among the tumbled boulders and undercut ledges which abound along the east side of the Narrows. In addition to octopus, divers frequently see wolf eels, rock cod, sea bass, ling cod, and perch.

Approximately a mile across the Narrows and right under the bridge, there are enough remains of the original collapsed bridge which provide for an interesting dive but it certainly is not as extensive as the east side.

The nearest boat launching ramp is a mile south of the bridge on the east side at the Narrows Marina. Marinas with rental boats of all types are found all around the Sound.

In every major town near Puget Sound, at least one fully-equipped dive shop can be found. Large cities like Seattle and Tacoma have several shops.

The water temperature is usually 45 degrees and seldom goes over 50 even in the summer, so a good wet suit or a well-sealed dry suit is a must.

Climatic conditions are considered mild in the Puget Sound area without extremes of hot or cold weather. Summer temperatures are usually in the 70- to 85-degree range. Winter brings 30 to 50 degrees with occasional dips into lower temperatures and perhaps two or three brief snow storms per winter. Divers can often expect to get wet before they enter Puget Sound because rain is plentiful.

From 1959 to 1965, there was a period of exploitation of the octopus in Puget Sound. I plead guilty to being a part of this exploitation although it seemed fascinating and the thing to do at the time. I was contacted by a Life magazine writer who asked me to arrange a diving excursion into octopus territory so underwater photographer Peter Stackpole could get some color photos of divers wrestling an octopus. Working with a mellow, highly talented person like Stackpole was a great experience. The culmination of the project was a double-page spread in the September 29, 1961, issue of *Life*. However, the written narration accompanying the photographs tended to be more sensational than realistic.

Also during the aforementioned years, the World's Octopus Wrestling Championships were held each April at Titlow Beach about a mile south of the Narrows Bridge.

Three-man teams competed for expensive trophies in this much-ballyhooed world competition. Thousands of spectators flocked to Titlow Beach to watch skin and scuba divers go after the eight-armed monsters. The highest combined octopus weight won the trophies with more points awarded per pound for octopuses taken during the skin diving part of the event.

Gary Keffler, a renowned Seattle diver who helped Bill Barada and Jacques Cousteau film television specials about the octopus, was one of the organizers of the octopus championships along with other members of the Puget Sound Mudsharks diving club. Gary also was on the U.S. National Spearfishing Team for several years when international competitions were held annually in various locations throughout the world.

Currently Gary is pleased that Puget Sound diving has grown beyond the highly competitive phase which once exploited marine animals. In my own case, I feel rather sheepish about the few trophies I did win and I am thankful that most divers today are expressing genuine concern for marine life.

If nothing else, the octopus championships did help dispel the frightening reputation of the octopus. Although a few of the captured octopuses were kept for research at the University of Puget Sound and the University of Washington, most were released to return to their caves and hiding places in the Sound.

The late Eileen Solie, a University of Puget Sound biologist, did a great deal of research on the octopus. She felt the octopus was not an endangered species but she agreed with the observations of longtime divers that the population had declined in Puget Sound. She strongly suspected that industrial wastes were a contributing factor.

Some Puget Sound industries have already cleaned up their acts, but hopefully much more will be done to improve Puget Sound water conditions in the near future. Recent federal studies have generated, through TV and newspaper coverage, a growing concern among Puget Sounders who are demanding that action be taken to clean up this inland sea.

I frankly felt quite pessimistic for awhile because I had not seen an octopus for a long time. But recently while I was poking around again in the ruins of "Galloping Gertie," one of my flippers hung up on something and didn't pull loose when I tried to wiggle it. I glanced back over my shoulder and saw that a large tentacle had grabbed the flipper. By the time I twisted around, the octopus released the suction cups and I had no further difficulty.

I remained quiet for some time, admiring the octopus which I judged was about an 80 pounder. Its chameleon-like ability to change color and blend into its surroundings made it almost invisible. After I pointed it out to my novice diving buddy, who was pretty excited and apprehensive about getting too close, I reached over and gently stroked the octopus a few times.

Later my diving buddy asked me why I was nodding my head and did I really say something to the octopus. As I petted the octopus, I had said, "Nice to see you, and may you have many children!" **S**

Catch the ones that got away

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Celebrity Seafood Sampler

BY MAVIS HILL

What do a former Astronaut, a well-loved "Old Mossback," and an international television personality have in common? A love for scuba diving and seafood.

Scott Carpenter, Al Tillman and Marlin Perkins, as diverse as their careers are, share the joys of diving and the delights of well prepared seafood. As we herald the arrival of the "serious" diving season, we present the favorite recipes of these distinguished men.

Albert A. Tillman

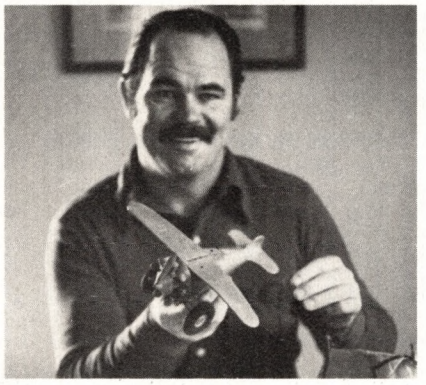
How to define "Old Mossback?" Webster says "old" as "wise," "familiar," and "having had long experience or practice," (as well as "A term of affection"). Mossback applies to anything, or anyone, "long in the business," in one definition.

Al Tillman is all of those things and much more. He's also a dedicated diver, conscientious and caring; a man who began his love of diving at an early age and never lost it. From the beginning, Al has worked toward the betterment of diving. For these efforts, he was awarded the NOGI Award for Distinguished Service in 1964. Until recently, Al has been one of the most popular and most frequently published writers of the scuba diving industry and sport. His articles have appeared in diving magazines for some 20 years or more. Tillman-authored books are still widely read in the industry, and his activities in underwater photography, spearfishing, film festivals, and as a top scuba diving instructor, are legend. His main profession was as a professor at UCLA, from which he is only semi-retired.

Now living at "Whalestooth Farm," his home on Orcas Island, Al ramrods a VIP dive escort service and fly-in trips to the island. Says Al, "Here in the Great Northwest, my writing now floats on great intentions, but here there is still virgin (although cold!) diving with a giant pet octopus and salmon jumping into our boat." He also grazes sheep, cuts lots of wood, sells antiques and runs special events for the Chamber of Commerce. Yes, despite what he says, he is still writing. A new book, "Special Event! Special Event!", is a cookbook for all kinds of special events,

Free-lance writer Mavis Hill specializes in diving, seafood and sea life. She has authored over 200 articles on edible sea life, plus a book, "The Edible Sea."

Al Tillman



from putting on a baby shower to supervising a wake, as Al says. Living the good life, and keeping in touch, Al submits his new favorite seafood recipe, "Sourdough Crab Blintz," for our pleasure:

Al Tillman's Sourdough Crab Blintz

(Prospectors, fishermen, and divers in the Great Northwest will walk through a blizzard for a single bite!)

Ingredients for Blintz Batter:

2 cups sourdough starter
2 tablespoons sugar
4 tablespoons oil
2 eggs
½ teaspoon salt
1 teaspoon baking soda

Into the sourdough, dump sugar, egg and oil. Mix well. Add soda as the last thing just before batter is ready to hit the griddle. Dilute soda in 1 tablespoon of warm water and *fold gently* into sourdough. Drop by spoonfulls onto hot griddle to make 6-inch "hotcakes." Bake to a "seal" brown. Into these hotcakes, spoon the following mix:

Filling Ingredients:

2 cups shredded crab
2 cups dry cottage cheese
1 egg
1 tablespoon grated onion

Fold edges of blintz up and over the filling like an envelope. Seal edges with sourdough batter. Brush with butter and heat in oven.

Marlin Perkins

No stranger to scuba divers or anyone for that matter, Marlin Perkins has entertained us below and above the water's surface through his television series, "Wild Kingdom," for some 35 years. His international reputation as a naturalist has its roots in Marlin's youth, when he roamed the fields near his Kansas home, continually adding to his collection of reptiles, mammals and birds.

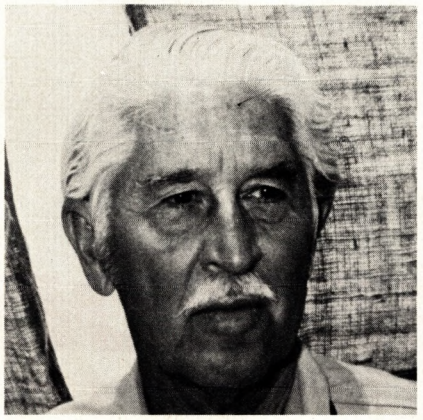
After studying zoology at the University of Missouri, Marlin began his career as curator ofthe Buffalo Zoological Gardens and later as director of the Lincoln Park Zoo in Chicago, which led to his TV debut

Illustration by Nick Fain

in 1945. A true "Brother of The Realm" in scuba diving, Perkins' inherent curiosity has led him through topside and underwater safaris in many countries on every continent on the globe — India, South America, Russia, the Arctic, Africa, Australia, Central America and Antarctica — earning him the reputation as the world's best known and most easily recognizable zoo director. His penchant for mystery has even taken him on an expedition to investigate the abominable snowman in the Himalayas, where he headed the zoological team of Sir Edmund Hillary in 1960.

At 80 years of age, Marlin Perkins attributes his continuing good health and vitality partly to his love of seafood and an active life, which includes a lot of diving, underwater photography and archaeology. He graciously shares two of his favorite seafood recipes with us here:

Marlin Perkins



Marlin Perkins' Fillet of Lemon Sole Sauteed

Fillet of sole
White wine
Salt
Cayenne pepper
Bay leaf
Bread crumbs
Sour cream
4 Tbs. butter

Marinate the fillets in white wine, salt, pepper, and bay leaf for about 2 hours. Remove from the marinade and drain on paper towels. Dip in bread crumbs lightly, then in sour cream and again in crumbs. Melt the butter in a large skillet and saute the fillets quickly on both sides. Do not overlook. Serve with lemon wedges.

Marlin's Baked Scrod Au Gratin

2 lbs. fresh scrod fillets
½ loaf sourdough bread, broken into chunks.
2 Tbsp. chopped parsley
4 Tbsp. melted butter or margarine
3 cloves garlic (chopped)
2 Tbsp. grated parmesan cheese
½ tsp. paprika
1 Tbsp. lemon juice
⅛ cup dry white white

Prepare the bread crumb topping by combining all ingredients (except scrod and wine) in a food processor — pulse until coarse, crumbly texture is achieved.

Place fish fillets on a slightly oiled baking sheet. Cover with the crumb topping. Pour wine around the edge of the pan.

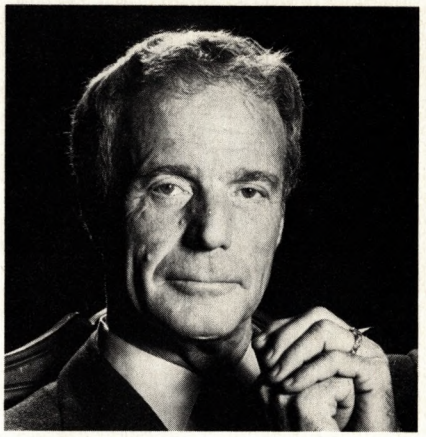
Bake the fish in a 400° oven for 10 minutes for each inch the fillets are thick.

Note: Once cooked, the crumb topping should be crispy and golden brown.

Scott Carpenter

One might say Scott Carpenter is "singularly unlimited." As a dynamic pioneer of modern exploration, he has the unique distinction of being the only human to date ever to penetrate both outer and inner space, thereby acquiring the dual title, astronaut/aquanaut.

Selected as one of the original seven U.S. Astronauts in 1959, Scott specialized in the fields of communication and navigation and served as backup pilot for John Glenn during the preparation for America's first manned orbital flight. He then flew the second American manned orbital flight on May 24, 1962, piloting his Aurora 7 spacecraft through three revolutions of the earth, reaching a maximum altitude of 164 miles.



Scott Carpenter

During the summer of 1965, Carpenter participated in the Navy's Man-In-The-Sea Program as an Aquanaut in the SEALAB II experiment off the coast of La Jolla, Cal. During this experiment, he spent 30 days living and working on the ocean floor. Subsequently participating in the SEALAB III experiments with the Navy's Deep Submergence System Project, Scott performed duties as Assistant for Aquanaut Operations in this project, which was responsible for the development of deep ocean search, rescue, salvage, ocean engineering, and Man-in-the-Sea capabilities; and the direction of the Navy's Saturation Diving Program.

Now 59 years old, Scott has retired from the Navy, but is still an avid scuba diver. He continues to apply his knowledge of aerospace and ocean engineering to the private sector when he's not busy stirring up a pot of his favorite clam chowder. He shares his unique recipe which follows:

Scott Carpenter's Clam Chowder

Ingredients:
¼-pound bacon
2 onions (chopped)
1 package Knorr's Cream of Leek soup mix
1 cup white wine
5 cans clams (or the equivalent of the real thing)
2 cups chopped potatoes
2 tablespoons parsley (chopped)
½-pint whipping cream

Fry the bacon, crumble and set aside. Saute onions in bacon grease, add soup mix and stir about one minute. Add 1 quart boiling water and cook until mixture thickens. Add 1 cup white wine and the liquid from the drained clams. Add 2 cups chopped potatoes. Cook about 40 minutes. Five minutes before serving, add 2 tablespoons chopped parsley, the clams and ½ pint whipping cream. Garnish with chopped bacon. **$**

BY MICHAEL BONIN

Illustrations by Nick Fain

In the Finest Tradition

The heir to Neoprene Pere and Fils invites you to learn "How We Make Our Gear."

Dear Gentlemen Divers

Many of our beloved clients write to us here at Neoprene Pere et Fils *(Masters of Rubber and Equippers to Diving Connoisseurs since 1066.) Some wish their family crest set in bas-relief on platinum air tanks. Or they are sending grandfather's double-breasted underwater hunting jacket (lined with panda fur) in to be recut. Invariably these requests are accompanied by inquiries as to How We Make Our Gear. We are, of course, only too happy to reply.*

Allow me to introduce myself. I am Michel-Riposte Neoprene, heir to the fabulous Neoprene fortune and Rubbermeister of the ancient and extensive Neoprene cellars. I speak for myself and my father — the powerful and enigmatic Baron von Neoprene — who sees no one. We welcome you, old sport, into our family and tradition.

No doubt many of you are acquainted with people who use conventional diving gear. Ordinarily, such shoddy equipment can be purchased at a Zody's or Fins 'R Us. These gruesome establishments do perform a useful service; for we ourselves are not interested in supplying goods to Joe Six-Pack. There, one can select aqua-blue "flippers" sealed to a gay cardboard backing with plastic wrap, or styrene snorkels that double as squirt-guns; an item favored by the repulsive children who throng to unsanitary municipal swimming pools. In order to pay for these parodies of actual gear, one is forced to queue up at cash registers with low-rent types wearing comical beer hats or t-shirts emblazoned with sexual innuendoes or deplorable witticisms.

This will never do.

Diving, the Sport of Kings, deserves better, and so do our friends. That is why Neoprene Pere et Fils exists. As I write, I gaze across the vast grounds of the baronial Neoprene estate where we have Made Our Gear since the Norman Conquest. Acres of vivid lawn are nibbled by Our Sheep — from which we get the thick, handsome wool for our Tweed Shooting Fins. A dense forest, peopled by artisan-folk in quaint burlap clothing, rises beyond.

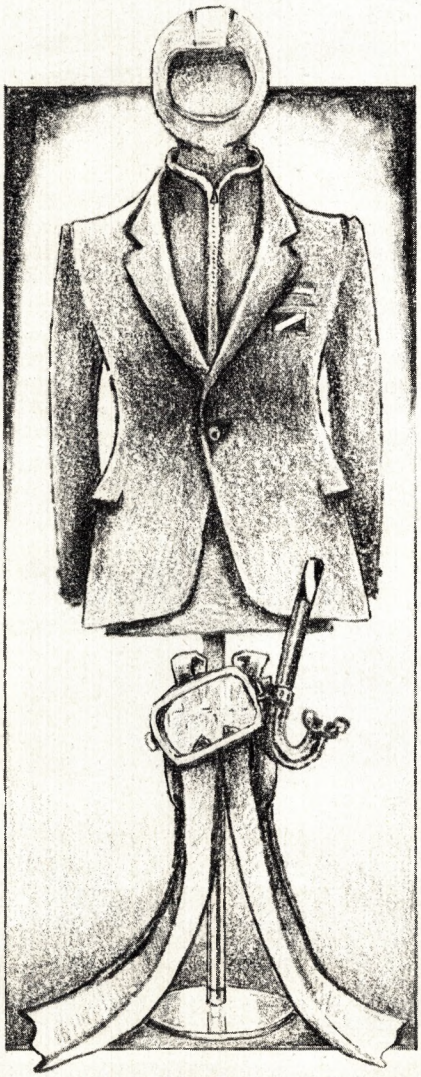
May we extend an invitation to Our

Michael Bonin, a SCUBAPRO diver, teaches writing at UCLA, where he is working on his Ph.D. in literature.

Clients? We would be gratified to take you on a tour of our works, and entertain you in our most Old-World manner.

The Old-World manor itself is built of massy stone and is large enough to be a zeppelin-hanger (which in fact it was during the Great War, when we converted ourselves into Dirigible Suppliers for the Austro-Hungarian Empire. We still offer custom blimps for every occasion.)

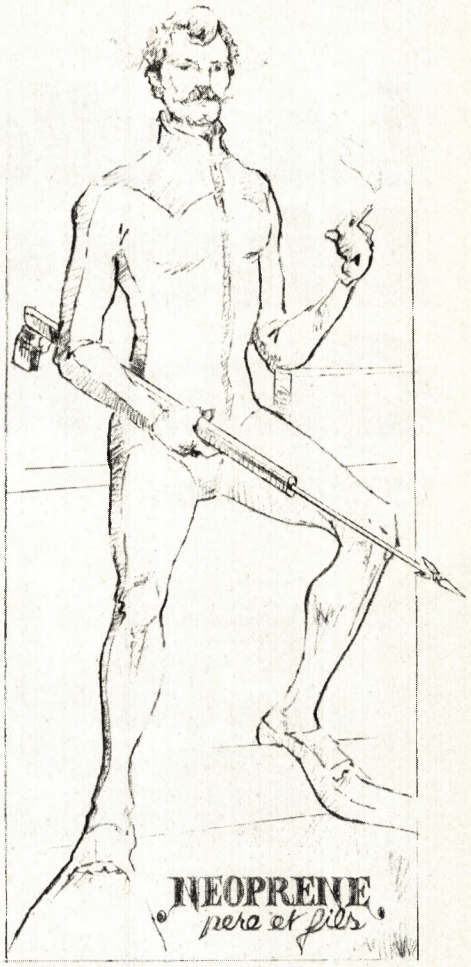
If you accept our invitation, we ask you not to arrive on foot. Enormous hairy guard-hounds are apt to carry you off to the forest for truncation. Much better to let us meet you in our Hispano-Suiza touring car. It is an impressive seven-mile cruise from the gates to the manor. Generally your first day with us is spent smugly relaxing in your private wing or sipping Armagnac in one of the library's red leather chairs. We have the largest library of Diving Fiction in the world, written by the world's greatest spearfishermen. Perhaps you will find yourself in conversation with one of Our Hunters, who spend their winters high on the Eiger, stalking the elusive rubatax. (We only use the finest alpine rubatex skins, and seven pelts go into each of our custom underwater smoking jackets.) That evening a feast will be held in your honor in the Great Hall, with an ox, no doubt expertly slain at table-side and roasted in the cavernous fireplace. You'll join in tankard-swinging choruses of "Quaff the Nut-Brown Ale, My Friend." And so to bed.



The next day commences the tour. Brother Oring will guide you by torchlight down to the more than 12 miles of cellars which contain Our Workshops. There you will find ancient tradition, artistry and wage-scales unknown in our world of plastic slipcovers and Hostess Sno-Balls. Gregorian chant fills the halls. The happy-merry-workers tug their forelocks and murmur, "Good day, Milord" as you pass. Our Metal Goods (for instance, our Diver's Sword) are handcrafted by a single family of smiths grown so accustomed to laboring underground as to have become positively dwarf-like. We make only 50 masks a year, and each requires more assembly steps than the aircraft carrier Minitz. In the sewing rooms, cloistered nuns, who like cave fish have lost the use of their eyes, painstakingly stitch the Spanish lace lining into our Ladies' Rubber Pantsuit.

Brother Oring will lead you through the labyrinthine storage cellars, founded in 1072 by Father Figure, the original Rubbermeister. The cellar monks tend to the bottles of Anti-fog which line the cavern walls. Some of these bottles have been aging for generations, and the monks will be glad to recommend vintages for your own collection. If you visit us during harvest time, you'll have the opportunity to witness the colorful stomping of the anti-fog grapes (spectramar berries) by the local rustics we enslave. These cheerful serfs sing shocking rugby songs while they gambol in the fruit vats, and their peasant children will entertain you with terrific practical jokes played on the farm animals. Year-round, however, your day ends with a grand ball back at the manor and the acclaimed Pageant of the Bottomfishes.

The highlight of the visit for most of our guests is the Dive Trip. Here Neoprene Pere et Fils tries to outdo itself. Far be it from us to arrange a melancholy wreck dive on a Dodge Dart sunk in a flood-control channel. Nor the usual game of Regulator Roulette that makes rental gear so exciting. Rather, you will accompany the handsome and virile Test Dive Team on a week-long passage. The Research and Development Clipper Oceanus, with an able-bodied crew of 212, will sail you to the dugong preserve at Ripley Seamount, or perhaps you'll spend your week doing bounce-dives in the Tongue-of-the-Ocean blue hole off the Bahamas. Last year's guests enjoyed



a dramatic at-sea encounter with the *Calypso,* with an authentic pirate boarding and a filmed humiliation of the French.

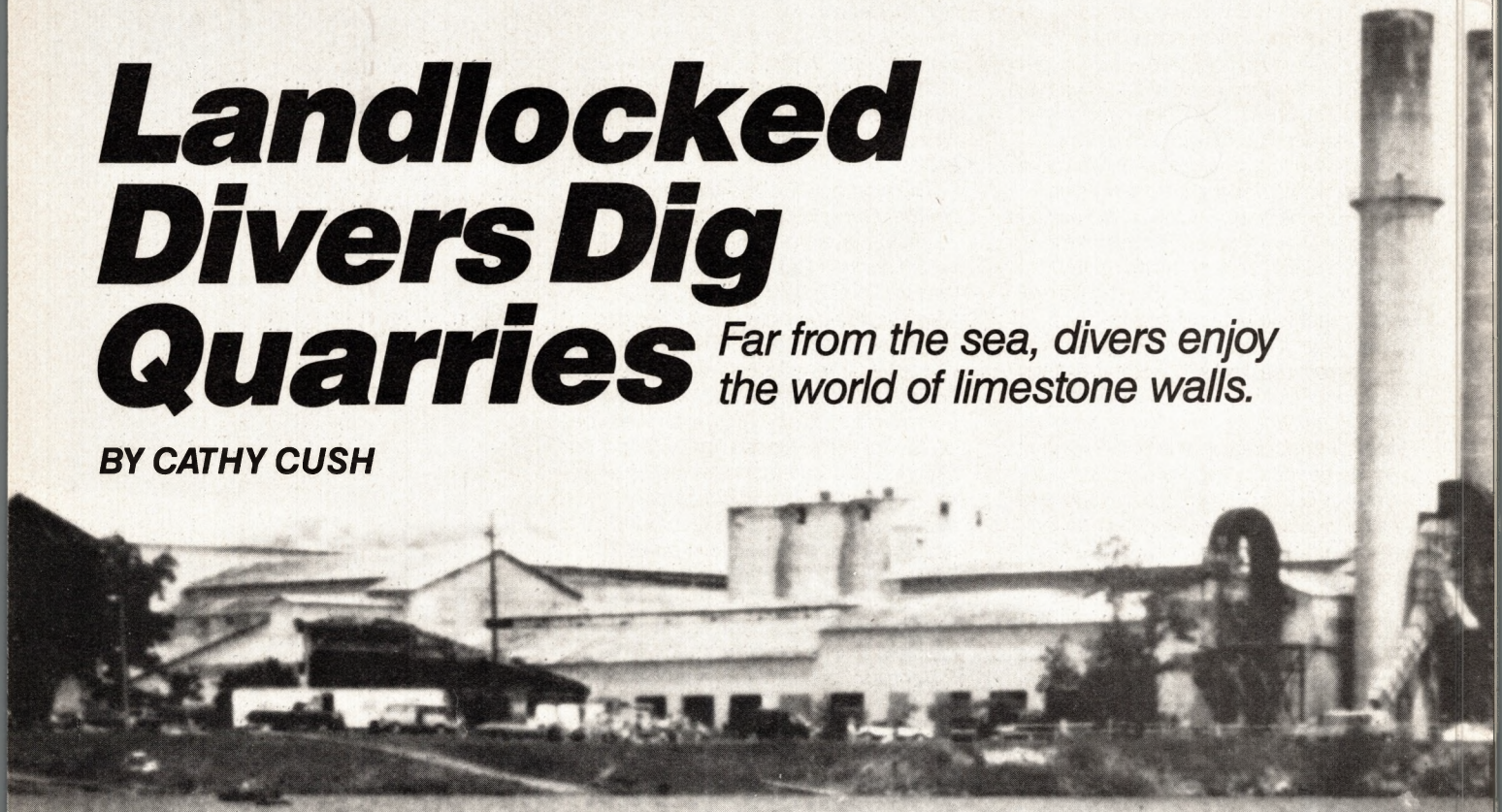
Finally, after your little voyage, our master tailors will measure you for a new wardrobe of diving apparel. Wonderful as our international chain of diver's boutiques may be, nothing matches the service, let us say the fawning attention, you will receive here within our walls. Everything for the diving bon vivant: silk apres-recompression pajamas, perfect for lounging in the chamber; a lightweight hopsack scuba-blazer, perfect for both temperate and tropical waters, with perhaps an apricot rip-stop nylon scarf knotted loosely around the neck. For night diving you will certainly want our black wool and latex-rubber blend tux, a pair of patent-leather slip-on fins, and a starched white pleated bouyancy compensator (very snappy when worn with our combination rubber hood/top hat). For serious stalkers, we have abalone-pattern camouflage suits.

Permit me to end by saluting you as a member of the aquatic aristocracy. *Neoprene Pere et Fils* has served your type from the time of Charles The Hammer Martel. We look forward to your visit — Our Drawbridge is Always Open. **S**

Landlocked Divers Dig Quarries

Far from the sea, divers enjoy the world of limestone walls.

BY CATHY CUSH



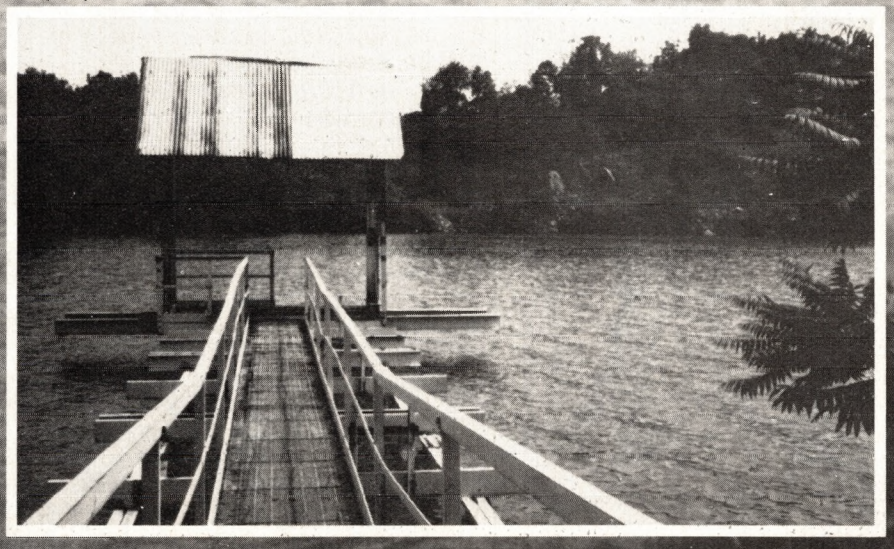
Thank God for the National Portland Cement Company. National Portland and companies like it have done — albeit unwittingly — as much for divers as some developers of well-known Caribbean resorts. Gaping pits dug into the earth will never be shown on the covers of the chic travel magazines, but divers can have a lot of fun in big holes in the ground — especially if they are full of water.

Portland Cement, which once mined limestone out of the hills around Allentown, Pa., was one of several such enterprises active in the Middle Atlantic area during the early 20th century. As was often the case, the quarriers hit a freshwater spring at some point in their labors. For a time, the spring water was pumped out. Later, when the work was abandoned, the quarry filled with water. In more recent years, many of these properties have been developed for recreational snorkeling and scuba diving.

Quarries have become popular training facilities for open-water skills. It's safe to say that most students from Pennsylvania, Ohio, New Jersey, Maryland, Delaware, West Virginia and Virginia make their first open-water, check-out dive in a quarry in their own or an adjacent state. While many divers sharpen their skills in the controlled environment of a landlocked quarry before tackling the open ocean, still others are content to spend much of their bottom time exploring the world within the limestone walls. And there is plenty to explore.

Facilities and attractions vary from one spot to another. Developers at places like Dutch Springs in Allentown, Pa., and the Willow Springs Club in Richland, Pa., have tried to create microcosms of a broader diving environment where divers can learn new skills in a variety of situations and conditions. At places like these, students can enter the water from sloping beach areas or practice "giant stride" entries off floating platforms. Submerged cabin cruisers, cars, airplanes and other vehicles give divers a taste of wreck diving. Platforms are also suspended at different depths where students can prac-

Diver, opposite, prepares to enter quarry at Dutch Springs. An old pier, below, makes for an easy entry into the quarry.



Cathie Cush is a free-lance writer based in Pennsylvania.

tice mask clearing and other skills.

Heavily silted bottoms at most quarries make good buoyancy control a must. If it's not exercised properly, the diver will get a quick introduction to limited visibility diving. Generally, visibility tends to be better early in the day, especially at popular quarries, before a lot of divers have had a chance to stir up the silt. Visibility also depends on the weather. Runoff from a few days of rain usually clouds the water. When the water warms up in late summer, algae blooms can also reduce visibility, although some places seem less susceptible to algae growth than others.

Normal quarry water temperatures require diving in a full wetsuit. Spring water is cold! Although the surface may heat up to 70 degrees or so in the summer, below the thermocline the water usually stays at about 45 degrees. A snorkeler who sticks to the edges where there is usually a lot to see where the rock face meets the water, can get away without a wetsuit. To explore the bottom, a diver will usually need a full quarter-inch suit, hood, boots and gloves.

Depths vary from quarry to quarry and from one spot to another within a single swimming hole. Divers can use 40-foot tables in either of the two quarries at Hamburg Quarry in Hamburg, N.J., and will find a maximum depth of 53 feet at Willow Springs Club. Pennsylvania's Dutch Springs and Millbrook Quarry in Haymarket, Va., feature areas with depths of 100 feet and greater.

But even the deeper quarries allow a diver to stay as shallow as he or she would like. Most quarry bottoms are uneven, with scattered plateaus and mounds that often reach almost to the surface. A rock island about 50 yards from shore at Dutch Springs offers an underwater landscape that brings to mind the western desert with its bluffs and mesas. But that doesn't mean it's barren. Freshwater plants grow from cracks in the rocks, and small bass and sunfish swim around the island. Even the rock patterns are interesting. If it hasn't rained in a while, a diver can stand on top of the island and be mostly out of the water.

Most of the more well-developed facilities provide maps showing the location of underwater attractions as well as their depths to make planning the day's diving easier. Sometimes sunken objects shown on the map are marked with floating buoys, linked by a series of connecting ropes, or both. It's usually more comfortable to follow the submerged ropes, if there are any, than to swim on the surface. On a hot day after the sun has warmed the upper reaches of the water, a swim across the surface in full wetsuit and gear can be less than refreshing.

Quarry bottoms can be full of fun things. Floating weightlessly through an underwater junkyard will bring out the 10-year-old in anybody. Thoughtful quarry

Divers check their gear before entering water at Dutch Springs.

owners and more often than not, divers themselves, have dumped unwanted vehicles into the depths to provide a playground for their guests. Divers can stand at the helm of cabin cruisers, swim around Volkswagons or peer from the cockpits of single-engine planes. At Millbrook, divers can "ride" an old school bus that cruises along the bottom. At Willow Springs they can follow the railroad tracks, which lead to the 72-foot "Quest." To one side of the tracks they'll find a crane. And there are at least a dozen other things to see at the 25-acre facility.

Some of the underwater attractions at quarries are leftovers from the days when heavy machinery ate into the hillsides. Some of this machinery is strewn on the bottom of the larger of the quarries at Hamburg. Known as Atlas Quarry in its working days in the early part of this century, Hamburg Quarry is said to have provided limestone for the cement in the locks of the Panama Canal.

At the White Star Quarry between Bowling Green and Toledo, Ohio, divers can ascend an empty mine shaft that rises at a 30-degree angle from 70 feet below the surface for about 40 feet. About eight feet in diameter, the shaft is clear of snags and safe for divers. The former limestone quarry is now part of Ohio's state park system. Fish swarm around an old shack that is now submerged in 30 feet of water at Nelson Ledges, another Ohio quarry.

The now-abandoned Portland Cement Factory reminds visitors at Dutch Springs of the quarry's original purpose. Beneath the surface are other reminders. What once was a roadbed cuts across the bottom. An iron staircase leading down into the quarry gives a new twist to sliding down the bannister. At one end of the quarry, divers can soar over the submerged treetops and telephone poles. The old pumphouse is close enough to the surface that snorkelers can reach it easily.

It's not necessary to go to the bottom to have an interesting dive. The sheer rock cliffs give a hint of what wall diving is like. Although the rocks can't compare with multi-hued Caribbean corals, they are a study in pattern and texture for the diver who takes the time to look closely.

Naturally, water clarity at a quarry is usually best farther away from entry points, and divers and snorkelers are likely to find fish in the tangles of semi-submerged bushes along the waterline.

A quarry trip can make for a very relaxing day which can be shared with the whole family. Just about any diver in the Northeast can find at least one quarry within a reasonable drive. And for divers who are susceptible to *mal de mer,* a quarry is a godsend — no waves, no boat rides, no lost lunches.

Land facilities at commercial quarries can range from a compressor at the gatehouse and a few Port-a-Potties to a fully-equipped pro shop, lockers, a restaurant and lounge. Willow Springs, Hamburg Quarry and Bainbridge Sportsmen's Club in Bainbridge, Pa., are among the quarries that offer camping to their guests. Dutch Springs plans to add campsites in the near future. Hamburg, which is open seven days a week all year, even offers cross-country skiing during the winter, although ice diving is not allowed there, as it is at some other quarries. It's pretty safe to say that picnicking is popular at all the quarries. Most are located in beautiful areas that would bear a visit even if there were no opportunities to dive.

Getting air fills is no problem. At the very least there will probably be a compressor on the premises, and at least one quarry has a full dive shop on the grounds. Most quarries will have a shop or two nearby for gear rental, air fills or last-minute purchases. But as with diving other spots, it pays to be prepared before leaving home, just in case. Shop hours don't always coincide with quarry hours, and a two-hour delay spent waiting for a shop to open to replace a broken mask strap or a forgotten BC is no way to start the day. The same holds true for other accessories. It makes more sense to bring sunscreen from home than to make an inconvenient extra trip to look for it.

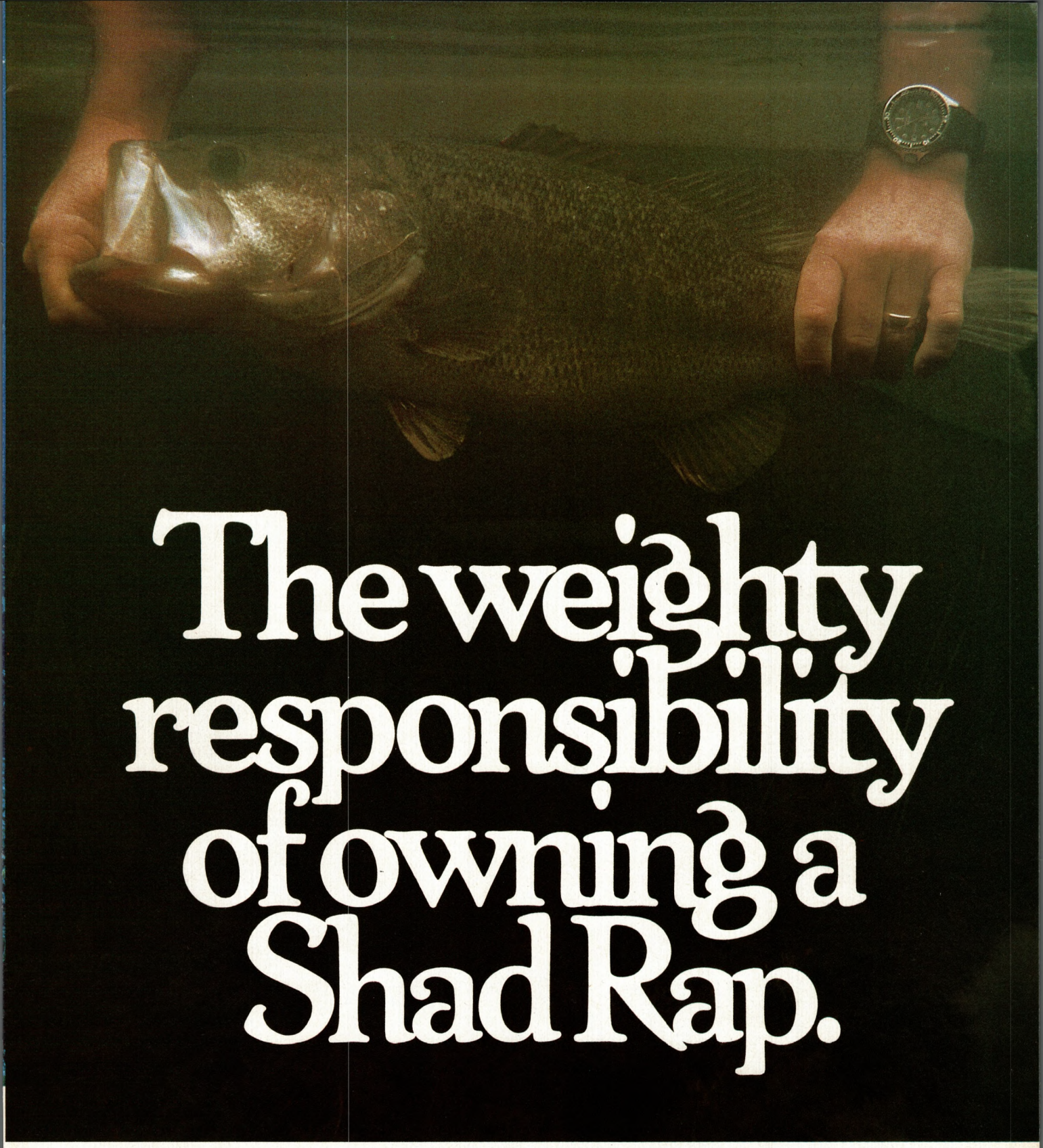
Some quarries, like Willow Springs and Hamburg, allow swimmers as well as divers. In fact, Willow Springs has set aside a shallow beach area for swimmers only. Dutch Springs is currently developing a swimming area. Millbrook, in Virginia, is open only to certified divers and their guests. Snorkelers who aren't certified divers might want to call ahead before visiting a quarry to find out what the policy is. For the most part, they'll find they are welcome.

Quarries, like anywhere else divers gather, seem to be fairly social spots. On a warm summer day a diver is likely to find anywhere from dozens to hundreds (depending on capacity) of other divers taking the plunge. Bainbridge is taking that a step further by organizing such diver-oriented activities as an Easter egg hunt, road rally and a pumpkin carving contest — all underwater.

Commercially developed quarries aren't the only alternative for a diver who's looking to get wet close to home. Some undeveloped quarries are open to divers; others aren't. It's best to check with the landowner first. Divers who want to explore West Virginia's Hydrospace must bring a notarized form releasing the quarry's owners of all responsibility for injury or equipment damage. Although visitors to places such as these may find more interesting artifacts here than at more frequently visited spots, they also have to contend with a lack of facilities. For example, there is no graded ramp or beach at Hydrospace, and carrying gear down the steep hill to the water there can be tiring.

Quarries offer a variety of opportunities to divers and snorkelers — and not just to students. Sure, they are great places to train and to gain exposure to open water. They're also great places to try out new equipment, or even to check out old equipment (and get some exercise) after a long winter's nap. They can also make the off-season shorter by extending the dive season from spring into late fall.

Perhaps the nicest aspect of quarry diving is the fact that it allows divers to do what they like best without giving up time spent with not-yet-certified family and friends in a way that boat diving just can't. And it gives those friends a chance to see up close how much fun diving can be. **$**



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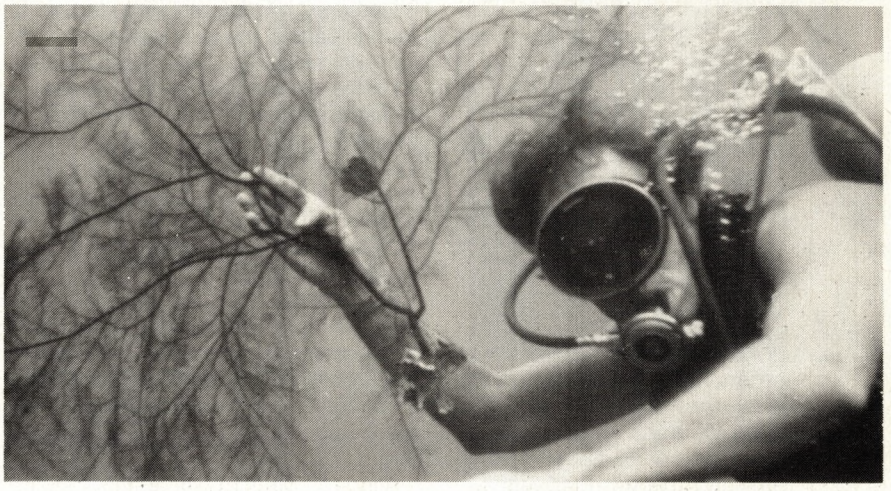
Black Jewels

Discovery and depletion has long been the history of this exquisite coral.

of the Reef

BY ELLSWORTH BOYD



A black coral tree with photos of finished coral used in a pin with pink coral flowers and a ring accented with pearls.

Originally discovered by the Mayans, who cut charms from it, and later cherished by kings, for centuries black coral has been the jewel of the sea.

Found in all the oceans of the world, of the 150 known species of black coral, only four are used commercially.

Although the precious coral fishery has long existed, attempts to manage the harvest have only recently been made. The pattern in the past, in different parts of the world, has been exploration, discovery, exploitation and depletion. In Hawaii, where the precious coral industry is growing, cooperation between the industry and state and federal managers has led to the development of a resource management plan for black coral.

Officially classified as a "fishery," regulatory measures in Hawaii determine who can harvest the coral commercially, how much they can bring up, and what sizes they may take. Managed by the state Fish and Game Department, a four-foot height limit has been established as the minimum legal size.

Conservation measures are important for the future growth and development of the fishery. Whether or not its potential can be realized, will largely depend on the management of known beds, discovery of new ones and the continued development of efficient methods of collection.

In Hawaii, commercial beds of black coral were discovered over 20 years ago and have since been worked by scuba divers at depths between 150 and 250 feet. About 15 commercial black coral divers work regularly in Hawaii. Sport divers take an incidental quantity.

Treacherous tides and currents, coupled with the great depth, make black coral diving a short-lived occupation. Few divers continue for more than 10 years because of the bends and other diver related accidents.

Ellsworth Boyd, a professor of Education at Towson State University, Baltimore, Maryland, writes about diving as an avocation. His work has appeared in every major diving publication.

Hawaii is one of the few places in the world where black coral is commercially gathered and exported. Exquisite jewelry appears in many showcases and shop windows throughout the state.

Large beds of Antipathes grandis grow off the coast of the old whaling village of Lahaina, near Maui, and off the southern coast of Kauai. Smaller beds have been reported off Sandy Beach, Oahu, and off South Point and Mahukona on the big island of Hawaii. Scattered colonies are found off almost all Hawaiian coasts at depths below 100 feet.

Some believe the deeper black coral grows, the better its quality. This is not true as poor specimens of low quality are found in both shallow and deep waters. In Hawaii, the best quality is found in water from 50 to 300 feet deep.

In shallow water, the black coral skeleton is not of even consistency and there are more predators clinging to and attacking the coral in shallow waters than in the deeper seas. But in the deeper waters, specimens tend to be smaller and more brittle.

Hawaii produces the largest and best quality black coral. It grows best in areas of subdued light. That's why it's often found on deep slopes, drop-offs and sometimes in caves.

Black corals belong to an order, within the class anthozoa, in the phylum Coelenterata. Other anthozoans include other reef corals, sea anemones and sea pens.

Black coral polyps secrete a skeletal substance similar in function to bones in humans. The skeleton consists of proteins and provides the structural support for the polyps which are rust-colored.

The skeleton of black coral appears black because it's opaque, but when thinly cut or powdered, the true rust-brown color appears.

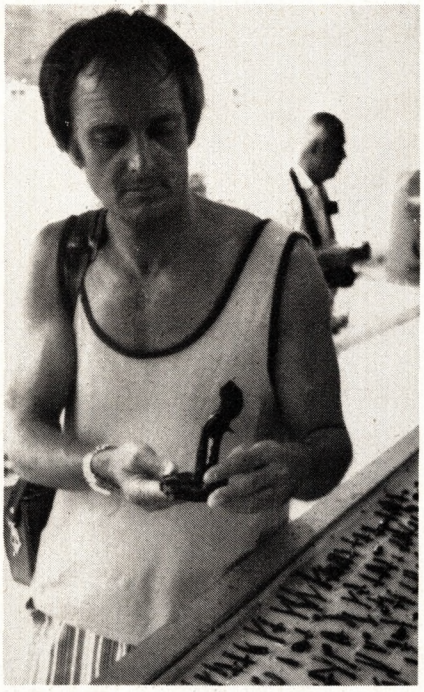
Although some divers refer to black coral as "trees," they are really colonies formed by thousands of tiny animals which secrete a proteinaceous skeleton.

Hawaiian waters don't have exclusive rights to this fascinating creature. Ken Bailey, a Miami marine biologist living and working on Andros Island in the Bahamas, has been studying black coral for five years. He has collected specimens six to 10 feet high, in waters 200 feet deep off the Andros Wall which is part of the third largest barrier reef in the world. He has also discovered black coral in waters 80 to 150 feet deep off Nassau, New Providence Island.

Jack McKenney, a freelance photographer, discovered acres of black coral growing in the deep waters off Grand Bahama Island. Yet one of the largest formations he saw was in only 60 feet of water on the sun-shaded rim of a bluehole.

Shallow water growth was also noted by Italian diver Bruno Vailati, who found a long-branching species in 60 to 100-foot depths in the Mediterranean. He photographed divers hand-plucking prize pieces from beneath overhangs and along the lips of caves.

Black coral is also found off Providenciales, Grand Bahama Island, Cozumel and Grand Caymen.



Pablo Toscano, a 10-year veteran of this dangerous business in Cozumel said, "We lose on an average, one diver a year. Most of the coral has been taken from the shallow reefs and the young divers — they defy the diving physics — are going much too deep.

"They work in pairs. One spots it, the other gets it. They go down 250 feet, stay too long, get narked and never return. One, who died last week, ran out of air coming up. He never made it to the surface . . . foolhardy, very foolhardy."

Even California waters host black coral flora. While piloting the Westinghouse research submarine, DEEPSTAR, Ed Buffington cruised over an extensive bed of black coral on the continental slope near Coronado Canyon in southern California. Spotting them at 1,300 feet, the DEEPSTAR pilot described the specimen as looking "like sooty tumbleweeds."

Buffington concluded the California species survives best on rugged, clean, calcareous bottoms, 130 feet or deeper. In 100 feet or less, colonies grew in caves or beneath overhangs where light was suppressed.

Dr. Richard W. (Rick) Grigg of the Hawaii Institute of Marine Biology, University of Hawaii, is one of the world's foremost authorities on precious corals. He has made over 800 precious coral dives all over the world and his scientific research has often been published.

Black coral is plain and unattractive in its rough, dried state, but with sandpaper, jeweler's rouge and a buffing machine, it can be turned into a delicate gem. The coral can be worked in three or four days after harvesting, but it's preferable to wait about six weeks to minimize cracking. It has a hardness of about 2.75 on the Mohs scale, compared to a diamond which is 10.

The finished products are absolutely fascinating. Finely carved, exquisite and unusual, black coral is a gem of great beauty and individuality. Hand-polished pieces aren't as glossy as those buffed on machines, where a matchless, radiant finish emerges with little effort. There are some imitations on the market, so be careful if you make a purchase.

Just as the finished products draw a variety of prices, so does the raw material. Prices vary on different islands and in various parts of the world, and like many products today, the price is often "whatever the market will bear." Quality of course is important; some specimens are poor to fair, while others are good to excellent. Those with thick bases, an inch or more in diameter, are prized as they are suitable for making rings. Black coral, like ivory and jade, is sold according to quality, size and demand.

Some of the finest pieces come from Maui Divers of Hawaii, Ltd., the largest coral jewelry manufacturer in the world. Black coral creations are designed and produced in the Honolulu factory, then distributed through a chain of specialized shops.

Although Maui Divers employs skilled artisans to fashion original creations, simple designs can be achieved by the average diver in a home workshop. I learned a lot about polishing and working with black coral from Joe Felsinger of Newark, Delaware. Felsinger was diving for black coral and creating beautiful jewelry 20 years ago, and few divers knew the precious product existed.

Felsinger waits about six weeks for his black coral to dry thoroughly. Then he cuts and separates the tree into three different piles: the base, branches, and the branch ends. The branch ends are the extremities of the tree that measure less than three-sixteenths of an inch in thickness. These can be used in flower arrangements, jewelry displays or aquariums. The tips of the branch ends have a unique beauty all their own, appearing rust-brown, the true color of the polyp. If the branch ends are encrusted with other coral or sponge growth, soak them for two hours in a solution of 50-50 Chlorox and water, then rinse.

Felsinger then sorts out the V-shaped or forked limbs that he calls "free-form branches." The large ones are popular for pins, especially when set with stones or pearls, while the smaller V-shapes make dainty earrings.

The remaining base of the tree can be used for rings if it's thick enough, or cut into nuggets for pendants. Growth rings are more predominant on the thick cuts of black coral and add a delicate dimension to finished pieces.

The only limit in working with the various parts of the black coral tree is the imagination of the lapidary. If you posses true artistic talent, you might be interested in carving it. Black coral is easy to work with, using high speed miniature power tools.

There are many ways of polishing black coral. Start with a wet-belt sander using a 220-mesh, silicon carbide belt to remove the rough outer layer. Then change to a 400 or 600-mesh silicon carbide belt. Be careful not to get heavy handed and don't be in a hurry. Undue friction causes reddish-brown spots to appear, blemishing the piece. It's a good idea to wear a gauze mask over your nose and mouth to screen out the fine dust.

Next, apply tripoli, in the stick form, to a fresh cotton flannel buff and gently buff the black coral. Tripoli, a very inexpensive, rough polishing compound, is used to polish metal as well as other corals and stones. Don't overload the buff with tripoli. If you do, streaks will appear on the coral and it will take additional time to buff them off. Again, be careful not to overheat the piece.

You'll get a very good polish from the tripoli, but to obtain the ultimate, there's one more step. Wash the coral in a mild detergent and water in order to remove all grit and tripoli before final polishing. Using a new, clean, cotton flannel buff, apply white jeweler's rouge, in stick form, and gently polish the piece. This produces a very fine, high-gloss finish.

To polish black coral by hand use three or four grades of sandpaper. Start with number 150 grade and sand the piece thoroughly. Then use number 320, then number 500, and finally number 600. The numbers of the sandpaper don't have to be exactly the ones listed, the idea is to go from rough to fine. The paper can be dry or wet — it doesn't matter.

After sanding, the piece is ready to buff. The tripoli stage can be skipped and only the white jeweler's rouge used.

Most divers don't own a hobbyist's buffing machine, but they might have a grindstone for sharpening tools that's interchangeable with a buffer. Or better still, most homeowners have an electric drill. Just shop around in the hobby stores or lapidary shops for a small buffer that fits into the drill just like a drill bit. Or, you could use the buffer you polish your car with. It's possible to buff the piece by hand, but the high speed is what gives it a brilliant finish. Again, be careful not to burn it. To do a small piece of coral, it usually takes about an hour, including all stages of sanding and final buffing. Time and patience will give you a beautiful finished product.

Rare and unusual, black coral is growing more popular as people learn more about it. Thanks to efforts of conservationists, at least in Hawaii, black coral should be available for future generations to enjoy. **S**

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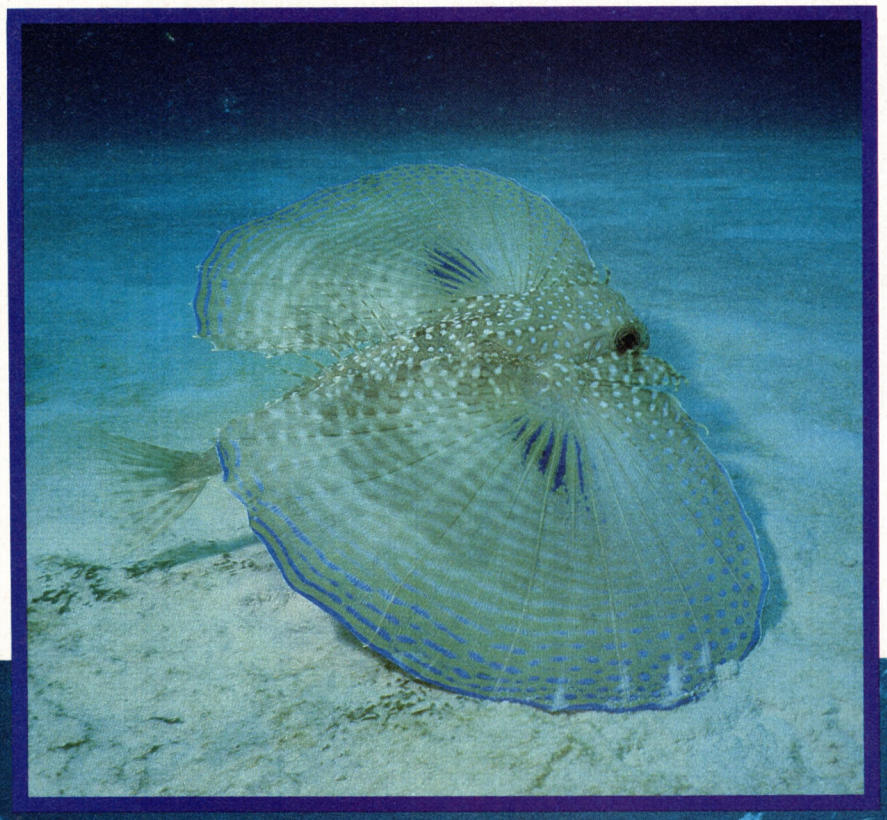


Resembling a sea robin, these interesting fish can glide over the bottom with the greatest of ease.

Presenting the Flying Gurnards

BY DAVE WOODWARD

No, they are not a center-ring attraction at Barnum and Bailey or Circus World; but in the arena of the sea, the flying gurnards are a tough act to follow. And, like high-wire performers, gurnards really cannot fly. Although early scientists observing these creatures did report short flights similar to the flying fish, the gurnards do not have sufficient wing strength to support even short glides above water.

The flying gurnard, Dactylopterus volitans, somewhat resembles the sea robin, and they are often mistaken for each other. Basic comparison shows the sea robin has three stalk-like, unwebbed pectoral spines projecting forward and down from the head. The wing-like pectoral fin structure of the sea robin is smaller proportionately to the body than that of the gurnard. Most authorities agree there are only two species; D. volitans, found along both Atlantic coasts, and D. orientalis, found in the Central and Western Pacific from Japan to Australia. So little is known about the gurnard, that some books and authorities disagree, and two other species are sometimes listed; Dactloptena papilio, found off the coast of Queensland, and Daicicus peterseni, seen off the coast of both South Africa and Japan.

The species observed most often by divers is volitans, usually found in the sandy areas of the Caribbean. Since volitans blends color-wise into its sandy environment, it is no wonder that divers and scientists know little about it. I dove in the Caribbean for almost 14 years before seeing my first one. The adults, approximately 10 to 12 inches long, are strictly bottom dwellers, and their light, tanish-brown body color, covered with reddish-brown bands and markings, allows them to easily blend into the sand. When disturbed, the wing-like pectoral fins are extended, and the peacock blue lines and blotches become evident. These fins are normally held tightly against the body, reaching to the base of the tail. Off the forward part of the pectoral fin next to the body, five webbed rays extend forward and down, serving as feeding paws. These fin extensions are used to fan and dig in the sand to locate the worms, crustaceans and mollusks that serve as their food.

Their wing-spreading actions, when startled, are most strange. With the fins tucked tightly against their bodies, gurnards can swim very rapidly. But with the wings outspread, they are reduced to a slow, circling movement.

On several occasions, when we found a mated pair, the larger, darker-colored fish (which we assume is the male) covers the smaller lighter female with a wing in a protective posture. Then, while she cowers down into the sand, the alleged male slowly swims grandly off as though to draw the intruder's attention away from his mate. This of course may be the all-too-easy human interpretation of a fish behavior pattern. In any event, gurnards are easily approached by divers if a little care is taken, and are most interesting to observe.

The juvenile gurnards, with their proportionately smaller pectoral fins, are so different from the adult form, that at one time they were classified in another genus. Since these juveniles dwell near the surface, it is possible that some type of airborne leaping may occur, accounting for the flying stories. The adults, however, have such heavy, bony plates on their heads, and such large body scales, that the fragile structure of the wings seems to preclude any type of out-of-water activity.

While very little is known about their habits and activities, there is one reported incident in the Caribbean of a lady stepping on the head of a gurnard while gathering mussels. Her foot immediately became very stiff and she lost feeling in it. The reaction was so severe it was only with some difficulty, she was brought back to the boat and returned home. This incident report seems somewhat suspect to me. In the Caymans, the spotted scorpionfish is called the "numbfish" by the natives. I suspect an incorrect identification of the culprit, for I have handled gurnards a number of times without problems.

The next time you are diving the sandy areas close to the reef in places such as San Salvador, Turks Island and the Florida Keys, keep your eyes open. You probably will not see any feats of aerial derring-do, but you may find the illusive Dactylopterus volitans giving a very interesting performance. **S**

Dave Woodward has taught underwater photography since 1967 and has been published in many books and magazines such as *Science Digest, National Geographic, World Signature* and *National Wildlife.*

Shop, Look and Listen before deciding on the best diving equipment for you.

Illustration by Nick Fain

Quality Gear... Don't Go Down Without It!

BY LOU FEAD

What's the difference between a Lincoln and a Ford? Both have four wheels touching the ground, a transmission, an engine, and each is designed to carry people from one place to another in relative comfort. So what's the difference?

"Quality." The same is true of a Cadillac in relation to a Chevy, but here you might include price. The same comparisons can be drawn with many products including diving equipment.

Quality in sport diving equipment, like quality in cars, greatly affects our lives. Ask anyone which they'd rather have. The answer most often comes back in favor of the higher quality equipment because it adds safety, capability, comfort, convenience, and yes, even prestige to snorkeling and scuba diving — it increases the quality of life in sport diving.

If you're like most divers, you'd prefer to be decked out in quality gear, and, if you're like most divers, you're probably confused by the many, many choices diving equipment manufacturers have provided in recent years.

In the beginning, which was not so long ago, there was only the hard-rubber "J" snorkel — take it or leave it. Now that "J" has almost disappeared, replaced by a plastic, large bore, soft-rubber, wrap-around, silicone "shotgun," and so many others, the choices are almost endless.

So how can you find the quality products amongst all these? And why bother?

Before answering these two questions, let's get together on what "quality" means so we won't be misled by the delusion that high price and high quality are necessarily the same. By knowing what quality is, we'll be able to recognize it regardless of price and thereby get the most from each equipment dollar.

Quality in goods such as diving equipment has two facets. One is excellence of materials and manufacture, the other is excellence of design and operation.

To be classified as "quality," not only should the gear be manufactured in a craftsmanlike manner of suitable and durable materials, it should be designed to operate effectively to achieve the desired result with a minimum of hassle.

The first aspect of quality is usually reflected in the price — a higher price is normally required to cover the greater cost of better materials and finer craftsmanship inherent in quality goods. Sometimes, however, that higher price may be the result of a poor design, therefore, price alone is not an absolute indicator of quality.

The second aspect of quality is more personal as it rests with the buyer. For example, consider a well-built, three-window mask with its great panoramic field of view. Is it of high quality for all divers?

Operationally, it may be for scuba divers, but not for thousands of skin divers. The difference being that a scuba diver can easily equalize the mask with tank air on descent, while a skin diver would rather wear a small-volume mask and not waste precious lung air equalizing. High quality for one, low for another.

The best indicator of operational quality is whether or not the gear will do its job.

Lou Fead is the author of the popular book "Easy Diver" and is a free-lance writer now based in Miami, Florida.

If it won't, it's not worth buying regardless of how well it's made or how long it will last. Conversely, even if the gear will do the job, it may not be worth buying if it's shoddily built of inferior materials.

Bob McConnell, who makes at least 70 dives a year, philosophized about the generally higher price of quality by saying, "I'd rather pay a little more and buy the gear just once, instead of starting with something cheap and having it fall apart in three dives."

One of my experiences along that line was with booties. Early in teaching diving, I tried to save some money by buying cheaper nylon-one booties, and I bought pair after pair after pair. Once, when my old favorites weren't available, I shelled out the extra bucks for a pair of nylon-twos. What a surprise — they lasted twice as long and cost only half again as much. Then came the molded-sole booties, which I now use. They last twice as long as the nylon-twos for just a few more dollars.

Each upgrade brought more dives per bootie dollar, which means the quality-priced booties were actually more economical in the long run.

Another benefit of quality equipment can be seen at the end of most dives. Compare the faces of those who are diving with the more modern, stabilizing jacket BC, with those in the clutches of the older, horsecollar style. The bet is you'll see more smiles and good cheer coming from the modern divers than those ringed by soggy antiquities. Though a horsecollar may be designed well and expertly fabricated from superior materials, for most divers it doesn't function as well as a stabilizing jacket BC, therefore the divers with stabilizing jacket BCs *enjoy* their dives more.

If economy and enjoyment are not enough reasons to buy quality equipment, then consider safety. Essentially, all diving equipment available in the US is safe; although quality equipment generally contains an extra degree of safety. For example, judge the added operational safety of a power-inflated BC over an orally-inflated BC. Wouldn't you say the power inflator gives its diver an added measure of safety for responding to an emergency? I should hope so.

With the knowledge that quality covers both manufacture and operation, and that higher-quality, higher-priced gear may in fact be less expensive to own per dive, more fun to dive, and safer; let's look at some schemes for evaluating that quality.

How can you judge the "quality" of the marvelous diving gear now on the market? By the advertisements? Listening to old salts? Following your instructor's lead?

Absolutely, but don't trust just one source of information. Factor in every source you can find, consider them all, and then make your own decision and enjoy your new equipment confident that you've made the best choices under the circumstances.

One fairly common place to start is by getting an opinion from someone else; a buddy, an instructor, a salesperson, a dive magazine, a manufacturer. Recognize though that divers are commonly overly-eager to voice opinions about anything — especially equipment they haven't used. Don't be misled by all you hear. Such currently popular equipment as the BC, alternate air source and power inflator have been maligned severely in the past, mostly by non-users.

To protect against uneducated opinions from any source, even yourself, make sure the opinion-giver has at least used the gear or otherwise been intimately involved with it.

For judging quality, good sources of information are "official" opinions from product reports in the various diving magazines, newsletters and in dive stores. Generally product reports which document formal tests in comparing several designs or brands of a class of equipment are more "official" than those which just describe a single unit. At the moment, there is no testing organization which evaluates all diving equipment and issues reports for consumer use.

When considering operational test results, make sure the tests conducted are appropriate to your ultimate use of the product. A regulator which fails an Arctic free-flow test by icing, may still deliver air quite satisfactorily for years in the tropics. A BC which floats 30 pounds in a seawater test by itself, just may not do so when strapped to a diver's body.

One way to test a number of regulators is to take them all down together and try them out.

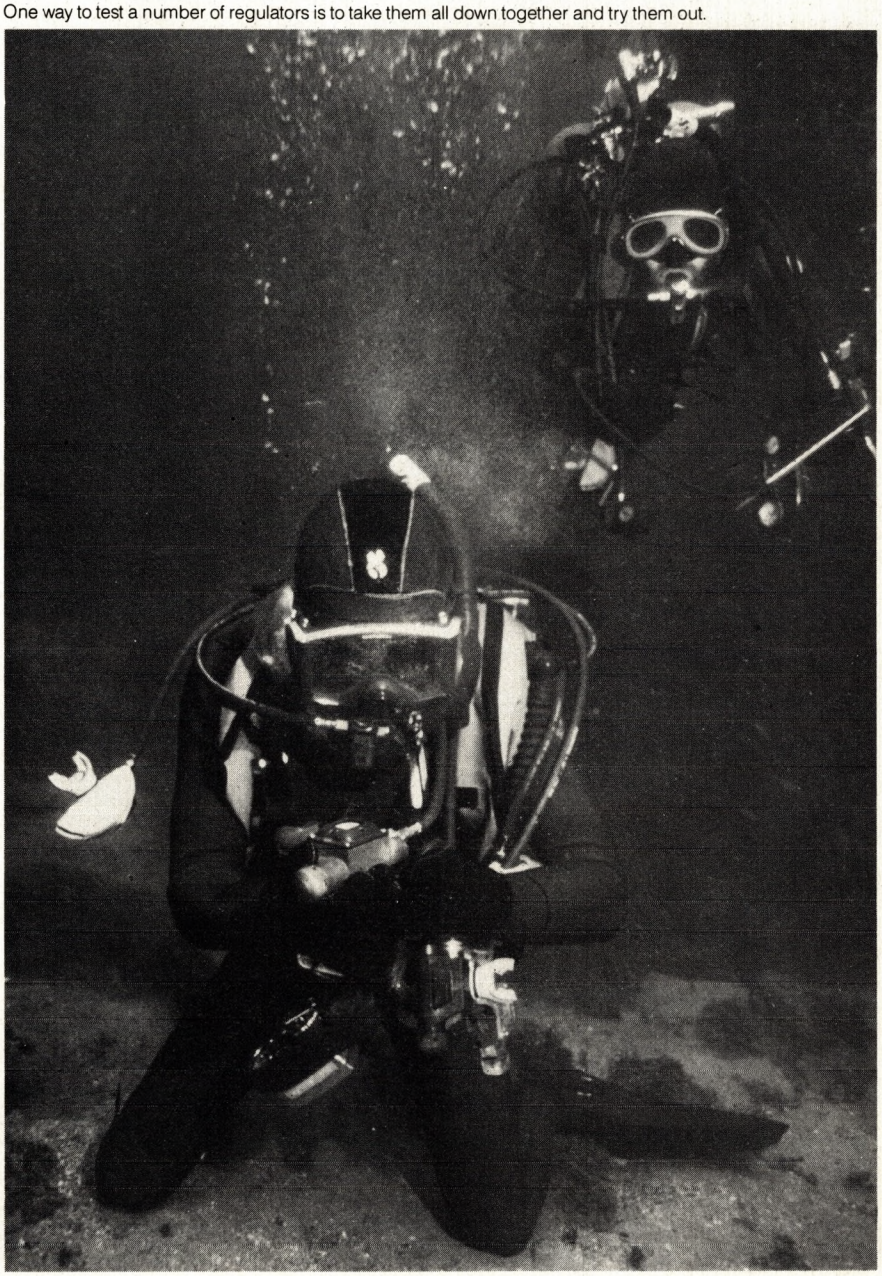
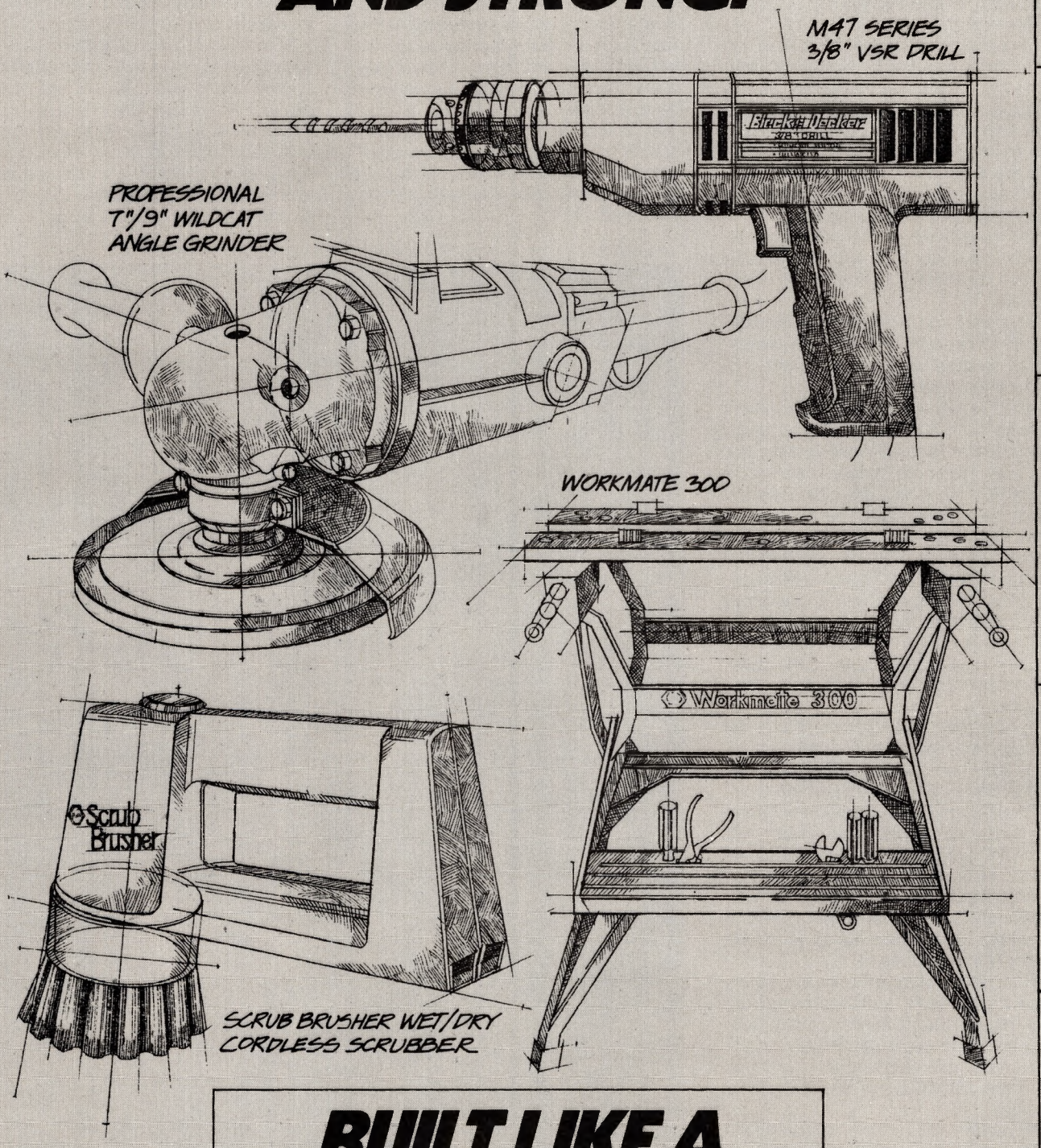


Photo by Gary Felton

BUILT TOUGH AND RELIABLE AND STRONG.



BUILT LIKE A BLACK & DECKER.

Verbal opinions from store owners, employees, and instructors may not be quite as "official" as written reports, but they are better in some ways because you have a chance to dig out the "why" behind anything that's doubtful. Remember to get a second opinion before deciding, and the second one's better if obtained out of hearing range of the first, just to avoid any collusion.

Divers on a boat, at the beach, in the woods, even at a resort bar can give you practical insights into the advantages and disadvantages of various gear. Two questions for judging the value of these "field" opinions are "how long have you had the gear, and, how many dives with it?" If the answer is, "Just bought it one dive ago," you should look to another source for an opinion.

One final warning — you've probably heard the saying that "actions speak louder than words." If you haven't, it's time you did and checked its validity by comparing verbal opinions you've heard with physical actions taken. In fact, often you can get a better opinion by watching instead of talking. Keep your eyes open and see what gear is being worn, which seems the easiest to operate, which divers seem to be enjoying themselves the most.

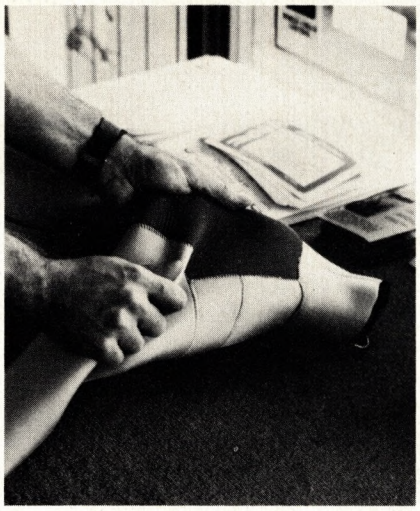
Visual inspection is just one way of checking for quality through your own personal observations. Remember again, however, that one opinion is usually not enough.

For instance, if you're going to try some gear out, do as Charlie Valance (Florida Institute of Technology's, diving department director) recommends. Try it at least three times to avoid getting the wrong impression. Three times because the first time you put a new rig on, you'll be acutely aware of how it's different from your old gear. You'll naturally concentrate on the differences on this dive. The second time gets better because you'll orient toward the new gear to find out how it really works. The third time it should feel relatively comfortable, if it ever will.

Now not every dive store lets you cart away its floor models to try out. Some almost do as they have demonstrator units for use in a pool or in open water. Others have "rent-to-buy" plans whereby portions of rental fees may be applied to subsequent purchases of similar equipment. Still others don't — generally because of lack of suitable water nearby.

It might be that the store you're dealing with hasn't set up an equipment trial program yet. Ask, and perhaps you'll be the first to participate.

Should you be unable to get wet with the gear, at least wear it around the shop a few times (remember three is the minimum) just to get the feel of it. Don't select something without hefting it around a bit to avoid such hassles as finding out



Before buying a wetsuit, check the seams for loose or missed stitches.

you're not able to buckle a waist strap because it's too short.

Besides making the gear do its thing to judge its operational quality, examine it closely to determine its manufactured quality — the degree of excellence of materials and fabrication. Any material and fabrication defects can be easily exposed by "kicking the tires."

Stretch sewn parts and check seams for loose threads, wobbling stitches, and even missed ones. Tug on glued seams which should be relatively smooth, completely welded together, and with very little slopped-over glue. Caress plastic parts to detect areas not dressed down — areas with extra plastic left over from the mold. Bend rubber hoses, fin straps, fin blades and the like to expose deterioration on the outside of the bend.

If you find lots of little defects on the outside, you can rightly conclude the inside is as well done, which adds up to low quality in any book.

Regardless of the quality built in, there's an additional amount that shows up after any sale, and that's in the *guarantee.* Although he'd been diving only three months, Peter Mottek counted the manufacturer's guarantee of a low-priced replacement bag quite heavily in his first purchase of a jacket style BC because he figured he'd wear the original bag out during the 7-year guarantee period.

Not all guarantees are the same, so read them carefully.

The final aspect of quality in diving equipment is the one Alan Friedland and his family of four other scuba divers found most important in their massive purchases — the quality of the dive store and manufacturer together. Are they just pushing sales, or are they in the business of making your sport a pleasure? It shouldn't take long to find out, especially if you do have a problem with any equipment after purchase.

It's your choice — to ride in style in a Lincoln or Cadillac, or just get there in a Ford or Chevy.

Take the time to evaluate both the manufactured and operational qualities of equipment. Gather information from divers, instructors and your own observations. Check out the guarantees, stores and manufacturers.

Then spend your sport dollar wisely on quality equipment for real economy, fun and safety.

Look beyond the price, the fancy doodads, and the sales pitch for true quality to enhance your overall enjoyment of the sport. **$**

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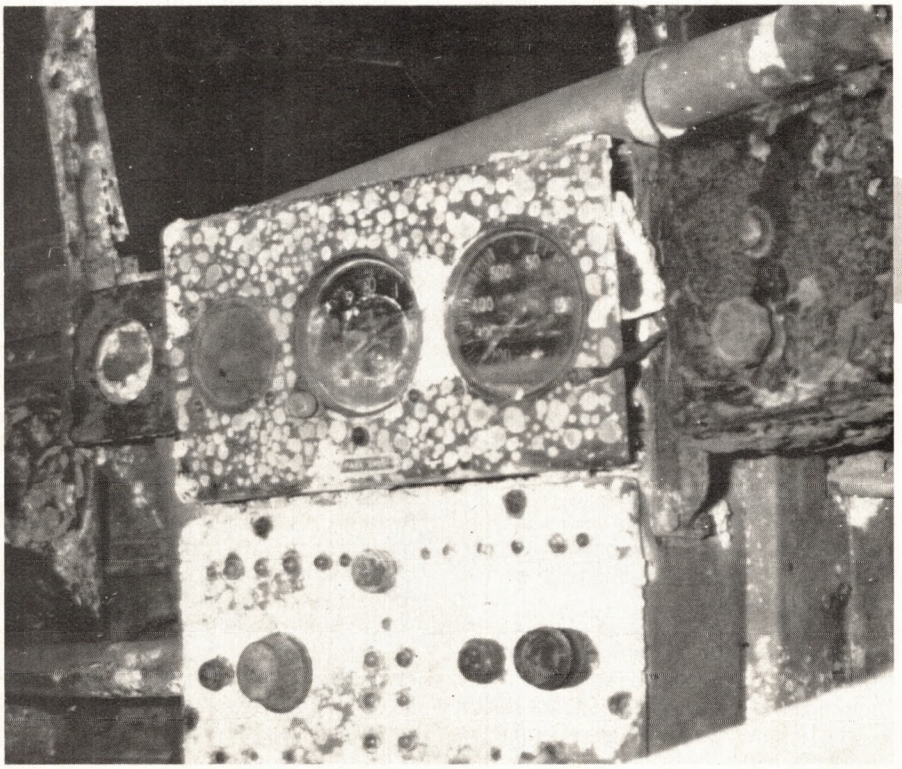
A B-25 recovered from Lake Greenwood in 1983 after lying on the lake bottom for 40 years. Below is a photo of the plane's instrument panel.

30 Seconds Over Lake Murray

BY WENDELL PATTON III

The guttural roar of their engines shatters the stillness of the night air; their massive shapes hardly discernible against the moonless sky. They had approached from the west, close to the tree tops of the forest over which they flew. Patchy fog shrouded the planes and told the pilots they were now only 40 miles from their targets — 40 miles to be flown entirely over water. The planes seemed to drop even lower until they were barely skimming over the waves, looking much like giant flying fish.

There were three of them, three of the most modern and advanced medium-range bombers in the world — the B-25. Their crews readied for the attack. Tension mounted. Twenty miles to target, the bomb doors opened. Bombardiers crouched over bomb sights mounted in the glass enclosed nose of the plane. Target sighted. Suddenly the number three plane drops and the outside wing catches a wave. The plane cartwheels across the water like a rock being skipped along the surface. Water spray glit-



Wendell Patton III began diving to expand a lifelong hobby of collecting historical artifacts.

ters in the darkness as the other two planes pull up to avoid hitting their sister ship. The stricken plane lands belly down, floating momentarily on the surface. Her crew frantically abandons her. Within seconds she slips beneath the surface, settling on the silty lake bottom some 100 feet below.

The following day, the target is attacked again, this time successfully. The crews of these flights could look down on the water and see a fuel slick from the plane that crashed the night before. Not all of her crew had survived.

It is early 1942 and the nation is at war — a war not of its making. Now it rallies to respond. These flights of B-25s are part of that response. Originating from an Army Air Corps field just west of Columbia, S.C., the planes target islands in the middle of Lake Murray, a lake created by an 8,000-foot earthen dam built across the Saluda River only 12 years earlier.

Lake Murray was created to produce electrical power. At the time, it was the largest reservoir for power production in the world. The lake, with 52,000 surface acres, 525 miles of shoreline, 41 miles long and 14 miles wide at its widest point became part of the war effort. On New Year's Day, 1942, no one suspected the part this lake would play would be historic.

A man, who ironically had left military service the same year Lake Murray was built, now returned to take command of a very special group of men and machines. He was a flyer, one who appreciated what the B-25 had to offer. He had also felt the pain of December 7, 1941. This man was going to take the war back to Japan.

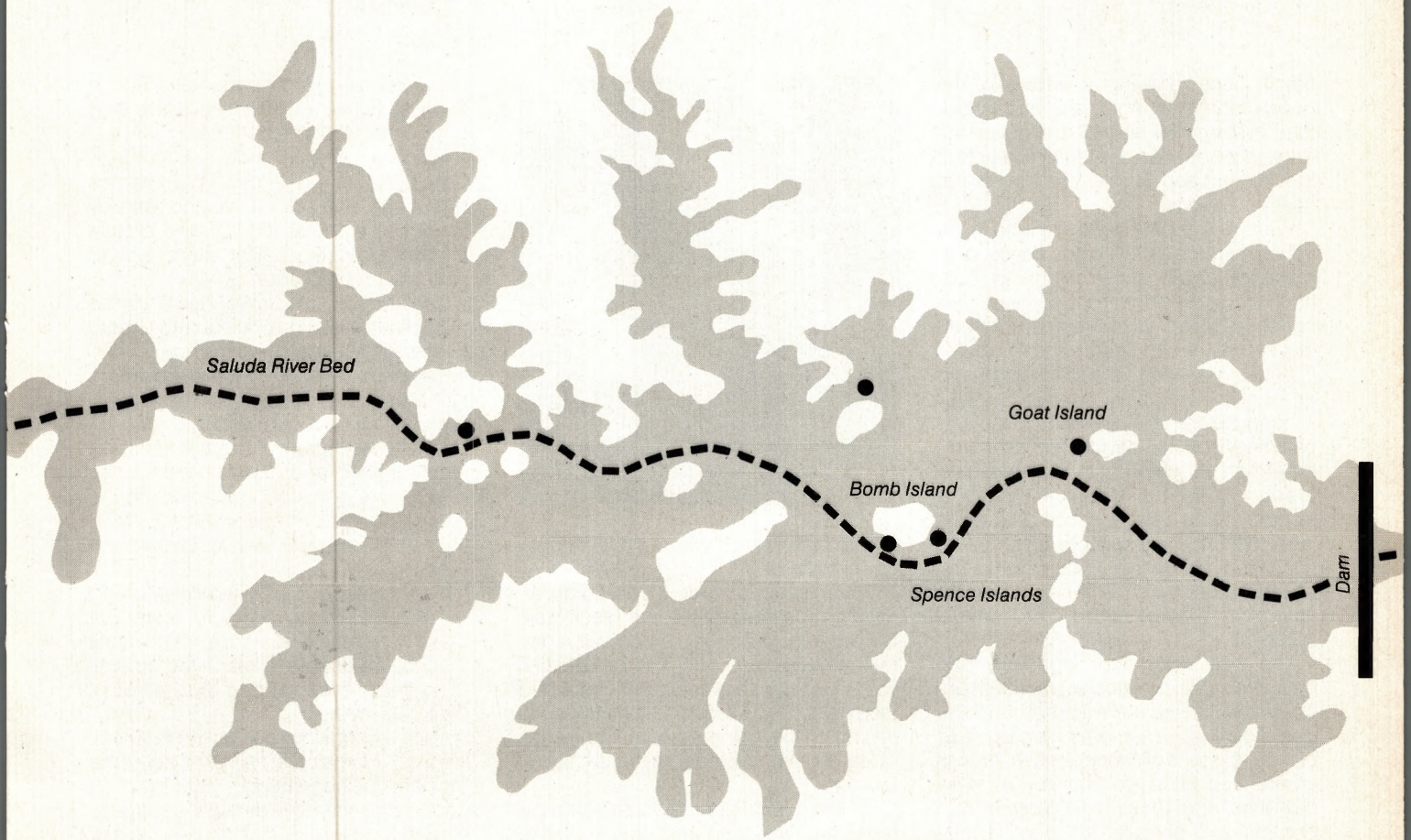
Jimmy Doolittle set about his task in earnest. Special runways, resembling the deck of an aircraft carrier were built. Using these, the land based B-25 was turned into a plane that could be launched from the deck of a carrier. The training was intense, but on April 18, 1942, Doolittle made it all pay off. He and his group of B-25s were launched from the deck of carriers off the coast of Japan and successfully bombed Tokyo. For this daring attack, Doolittle received the Congressional Medal of Honor and the nation received a much needed shot in the arm. Lake Murray's part in all of this was soon forgotten.

But its usefulness as a training site continued. After Doolittle's raid, the training activities at Lake Murray intensified. The islands made perfect targets. B-25s bombed these little islands almost daily until late 1945. The demands of war began to take their toll, even at the training sites. Less and less time was available for pilot training as they were badly needed in the war zones. Some pilots were sent to war with only several week's training. It was inevitable that training crashes would occur.

And crash they did. Just how many is not entirely clear. Some of the wrecks were removed, others were not. Estimates of the number of B-25s still in Lake Murray range from three to as high as 23. The most commonly heard number is 15. Coy Bayne in his book, "Lake Murray: Legend and Leisure" interviewed an instructor-bombardier whose B-25 crashed in Lake Murray in November, 1942. His plane was removed from the lake but the crash killed four of his crew. This instructor went on to say that he knew of 21 men killed on Lake Murray bombing runs in a two-week period. When Bayne asked the man if the reported number of 23 planes in the lake seemed reasonable, his answer was

(Please turn to page 75)

Dots are approximate locations of reported sightings of crashed B-25s.



Not all the B-25 pilots Jimmy Doolittle trained for his famous raid on Tokyo passed the test on this South Carolina lake.

BY CARL HANSEN

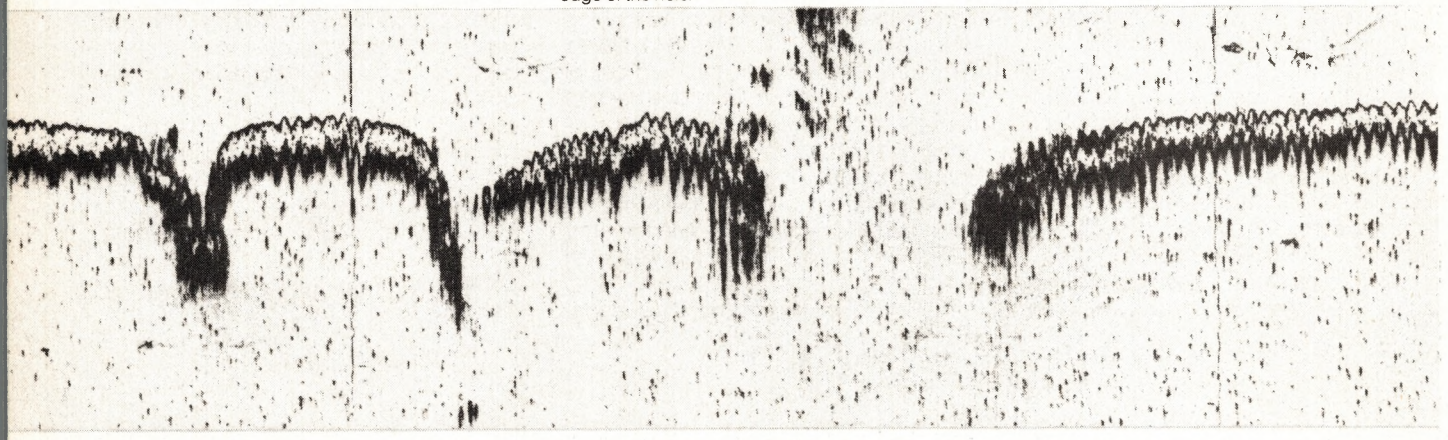
Diving the Gulf's

Black Hole . . . The very name conjures visions of an outer space mystery where light and everything else crossing its portal disappears forever.

A far less threatening but similar natural oddity exists just off the Florida coast 25 miles out into the Gulf of Mexico. As your boat cruises along with the blue sky above and the blue-green water below, the vessel's depth sounder is recording a flat, sandy bottom 65 feet down, gradually sloping to 70 feet.

Suddenly, the sounder's needle stops printing — as if the sea is swallowing the sonar signals. Then, scant seconds after it quit recording, the needle resumes its frantic pace, drawing a picture of the ocean floor below. Again showing flat bottom, between 65 and 70 feet down, the depth sounder has passed over a hole in the ocean floor, a hole that appears to have no bottom.

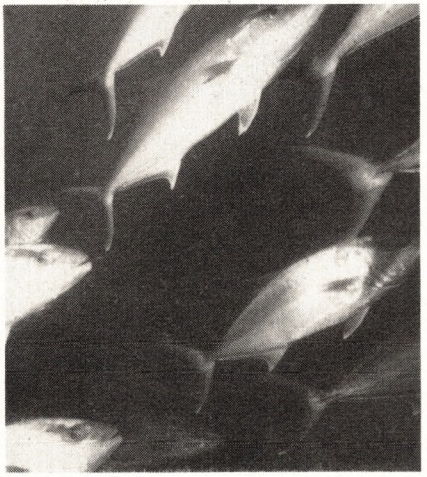
Chart depth recorder shows opening of the Black Hole. A school of jacks is always waiting to greet divers at the edge of the hole.



What was experienced is a hole in the earth's surface — an inner space phenomenon which is just beginning to attract the attention of Florida's vast dive community. The hole is approximately 80 feet across, and its unique shape causes it to literally swallow up sonar signals and never give them back.

Long before the invention of sophisticated navigational devices, south Florida fishermen stumbled onto this unusually productive fishing hole due west of a sleepy fishing village called Marco Island. With no landmarks to guide them, relocating an 80-foot wide hole in the ocean floor required either an inordinate amount of luck or fantastic skill with a compass.

The local fishermen apparently had both and stories of a secret place with unbelievable fishing were told around the dockside bars. The more boisterous told of reeling in tons of snook, jewfish, grouper and red snapper. The jewfish were monsters ranging up to 400 pounds, the grouper and snapper so plentiful they couldn't be kept off the hooks. A fisherman's catch was only limited by the capacity of his boat.



When depth sounders and Loran arrived on the local scene, the Black Hole became easier to find. Of course, commercial fishermen and charter captains who had the Loran numbers guarded them jealously. Although the fantastic stories made the numbers worth thousands of dollars, the captains kept their secret for years.

When the first fathometers revealed the hole's unique shape and unmeasurable depth, some captains became convinced that it was an extinct volcano, bottomless or at least thousands of feet deep. Still others, citing instances when they saw water roiling at the surface, believe it to be a huge, intermittently active and dangerous freshwater spring.

Volcano, Black Hole, Bottomless Crack, Big Spring — descriptive names of all kinds were coined over the years by fishermen trying to identify and explain this increasingly popular site they had visited but never seen.

Local divers, of course, heard stories about this mysterious hole in the ocean. Eventually they obtained the Loran numbers and in no time were exploring it. None, however, dared venture into the Black Hole's deepest realms.

Finally last summer, a small group of highly trained and experienced Florida cave divers gathered at Naples (on the coast just north of Marco Island). Their trip's sole purpose was to explore the Black Hole.

By then, local divers had been diving the Black Hole for nearly 10 years. But these were the first to do what many thought impossible — reach the bottom. In so doing, they stripped away much of the hole's mystery.

Their explorations solved the puzzle of the Black Hole's creation. It was not some frightening phenomenon, but in fact an underwater sink hole identical in shape to others found throughout the peninsula of Florida.

Sink holes are created by underground water systems which, through centuries, erode the limerock creating gigantic un-

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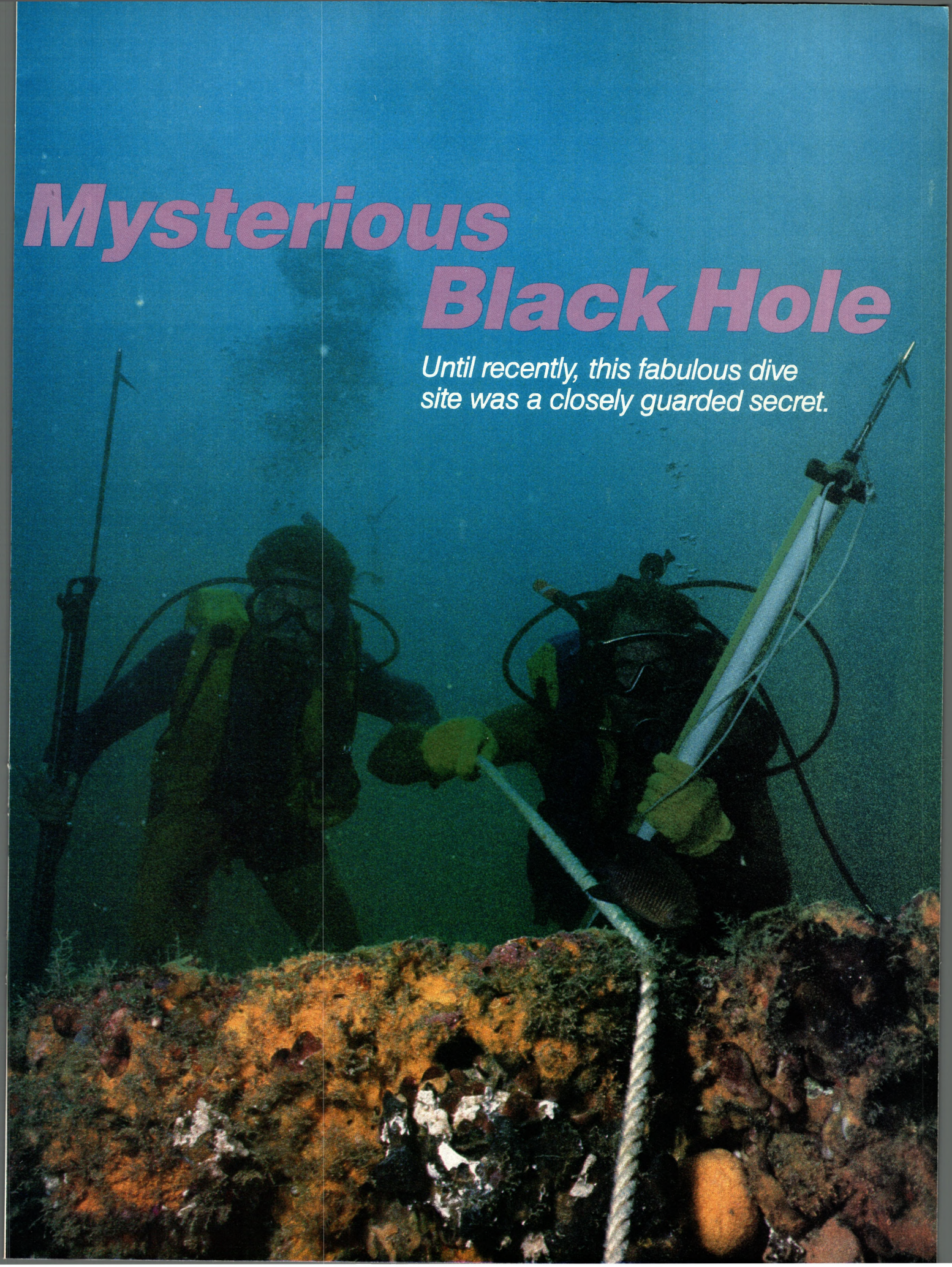
Carl Hansen is a diving writer based in Naples, Florida.

Mysterious Black Hole

Until recently, this fabulous dive site was a closely guarded secret.



derground caverns. When a cavern's ceiling collapses, the earth — or in this case limerock — above, follows it down leaving a hole at the surface. The Black Hole's distinctive hourglass shape reveals its origin. The cave divers also established that its true depth is 197 feet.

The sink hole's hourglass shape is credited with keeping its depth a secret for so long. Sonar signals are transmitted downward and bounce off the sandy bottom. But instead of returning to the onboard recorder, the signals are deflected toward the bottom again by overhanging ledges.

Since last summer, the Black Hole has become known as the region's most unusual and thrilling dive, with several dive boats from Naples and Marco Island regularly scheduling weekend trips.

The boat ride takes an hour during which divers have an opportunity to develop a dive plan with the boat captain. Safety is emphasized by the local charter captains. They don't take inexperienced divers to the Black Hole.

On site, the captain drops a large sea anchor into the middle of the hole, then backs the boat until he feels the anchor grip firmly to the wall of the hole. The anchor line is a direct descent line into the hole.

Before entering the water, all divers agree to a dive plan which includes both a maximum depth and maximum bottom time. The hole's structure makes diving extremely deep unnecessary. Around the first series of ledges, between 70 and 90 feet, there are as many interesting sights as the 100 to 125-foot level. The shallower the dive, the more bottom time divers have to explore what has to be one of the most unique series of walls, ledges and caves in the United States.

A group of barracuda, some as large as five feet in length, typically gather around any boat anchored in the hole. They are just curious and swim off lazily if approached.

After entering the water, the divers swim to the boat's bow and descend along the anchor line.

Leaving the sentinel barracuda behind, divers hit a thermocline at 45 feet. During summer months the surface water temperature is usually around 80 degrees. When winter arrives the temperature drops to the low 70s. From the thermocline on down the water is about 10 degrees colder.

As the divers continue their descent, they typically pass through a school of large jacks just before the white sand bottom comes into view. The anchor line leads to where the bottom should be, but instead the hole drops off into a black abyss.

Divers ascend an anchor line after diving the Black Hole.

Schools of red snapper, spade fish, and occasionally red and black grouper can be seen around the lip of the hole and down to the limits of visibility.

On rare occasions visibility in this part of the Gulf of Mexico is nearly 100 feet, but average visibility is 20 to 30 feet, seldom good enough to see from rim to rim.

As divers drop into the hole, it isn't unusual to have a pair of four-foot amberjack join formation with them. Left unmolested, these extremely curious fish will remain two or three feet off the shoulder of a diver for an entire dive.

Hanging in midwater and looking up, the hole's shape becomes apparent. The lip is sharply undercut. Then, 15 feet farther down, a second ledge flares out. Visibility inside the hole is usually better than above where wave action affects it more.

A series of undercut ledges continues on down into the hole providing ideal habitat for game fish and tropicals. This is the area nicknamed "Home of the Upside Down Angels." Brightly colored tropicals living here (including the conspicuous queen angelfish) swim belly toward rock surface, which in this case means they are swimming upside down, bellies toward the overhanging ledges' underside.

The rock walls in the first 30 feet of the hole are a virtual photographic smorgasbord. Although this part of the gulf has no hard coral, there is a limitless variety of colorful creatures to excite the underwater photographer. Small sponges of every shape and hue cling to the walls while elsewhere there are spiney oysters, flame scallops, feather dusters, tube worms, anemones, crabs, arrow crabs, Atlantic deer coweries, and nudibranches.

Small morays, rare in the Gulf of Mexico, have been spotted living in the walls. One diver even told of seeing a bright red coral in and around the mouth of one cavern.

This is also where giant jewfish are first encountered. Capt. Gene Luciano, who operates the 65-foot dive boat "Dalis," probably dives this site as often as anybody and says he can't remember a dive when he didn't count at least 10 jewfish in the 90- to 400-pound category.

Large loggerhead turtles provide another interesting facet to this dive. Usually found sleeping under ledges or in caves between the 80- and 100-foot levels, they are extremely tolerant of divers who approach cautiously and don't harass them.

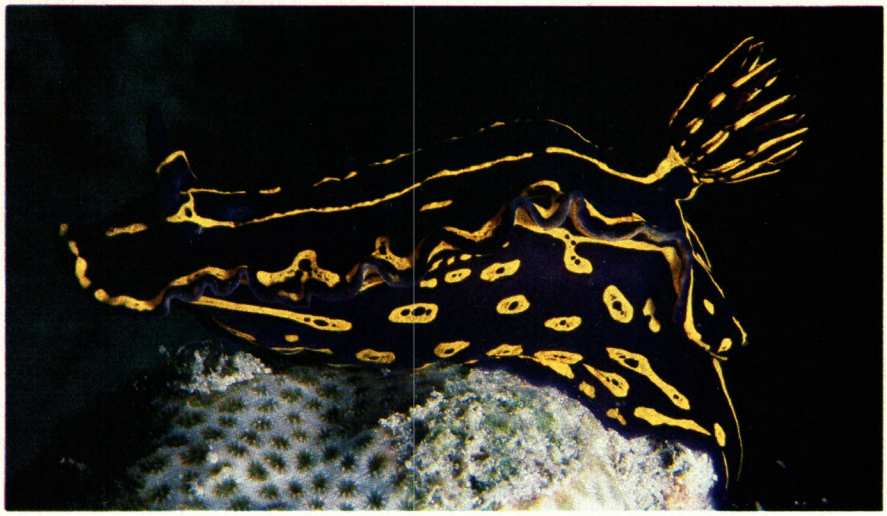
Because of the dive's limited bottom time, spearfishing isn't encouraged although it is legal. Capt. Luciano explains it best when he tells divers, "It's very difficult to shoot fish — they've got too many places to run away and hide."

The abundant cover that makes spearfishing difficult makes this ideal habitat for Florida's spiney lobster. The limestone walls are riddled with chambers of every size extending deep into the rock.

Capt. Leighton Ingram, who has run charter fishing boats to the Black Hole for as long as anybody tells of catching boat loads of jewfish. He regularly check the big fishes' stomach contents and without exception they contained lobster — some of the largest lobster he has ever seen. To date, however, no one has figured a way to catch the Black Hole's elusive lobster. The dive's depth combined with the honeycombed nature of the limestone walls makes it nearly impossible to locate the crustaceans.

One enthusiastic diver who has enjoyed the Black Hole experience many times summed it up quite simply when he said, "You'd have to dive it 500 times to see everything." Amen! $

Above, a large loggerhead turtle found in the Black Hole is a cooperative photo model if unmolested. At right, a diver suspends beneath a ledge in the hole. Below left, a Greek Goddess nudibranch and purple tipped anemone, right.



BY FRANCIS LE GUEN

Dolmen of the Deep

Background photo shows coastline not far from Pil Coa. Photo above shows dolmen after algae was removed. Opposite left is the ancient wheel in the small cave where it was discovered. Engravings typical of those found on land-based dolmens are shown, opposite right.

I have been swimming against the current for 20 minutes, my exhausted air bubbles rise like medusa jellyfish in the green water. On the left, all I see is a sand plain scattered with flounders; on the right, a granite overhang above a wall. Clouds of small fish disperse in the murky water. I am beginning to think my search is a waste of time — sand as far as the eye can see. All of a sudden, there it is — a hewed granite slab which must weigh at least two tons, lies on three carefully adjusted stone legs. Unbelievable! I cast an anxious glance at my depth gauge which reads only 80 feet. Nitrogen narcosis will not be a problem. We are swimming in front of a relic from the Magalithic Age, a dolmen built on the floor of the Sea of Brittany.

Off the little harbor of Poulennou, in North Finistere, in the northwest corner of France, rises a reef called Pil Coa by the local fishermen. It is only a small ink blot on the map surrounded by 90 feet of water. I am convinced that in the course of history more than a few ships have been wrecked on this spot. However, what we were to discover was beyond all our hopes and of greater importance than any wreck.

The sea was smooth as we headed off the coast, taking bearing on steeples of churches jutting above the rocky shoreline. The north coast is jagged with islets of granite scattered in the sea like so many traps where the tidal currents can sweep unsuspecting boats. Seamen of Brittany were once

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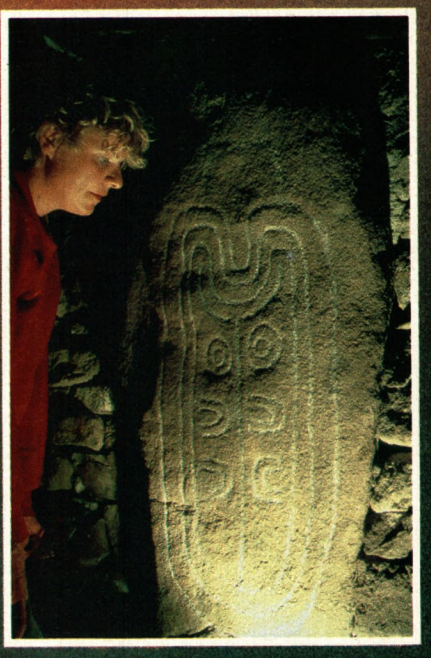
Francis LeGuen is a French photographer for the SYGMA press agency and a free-lance writer.

French divers discover an ancient dolmen off the Brittany Coast.



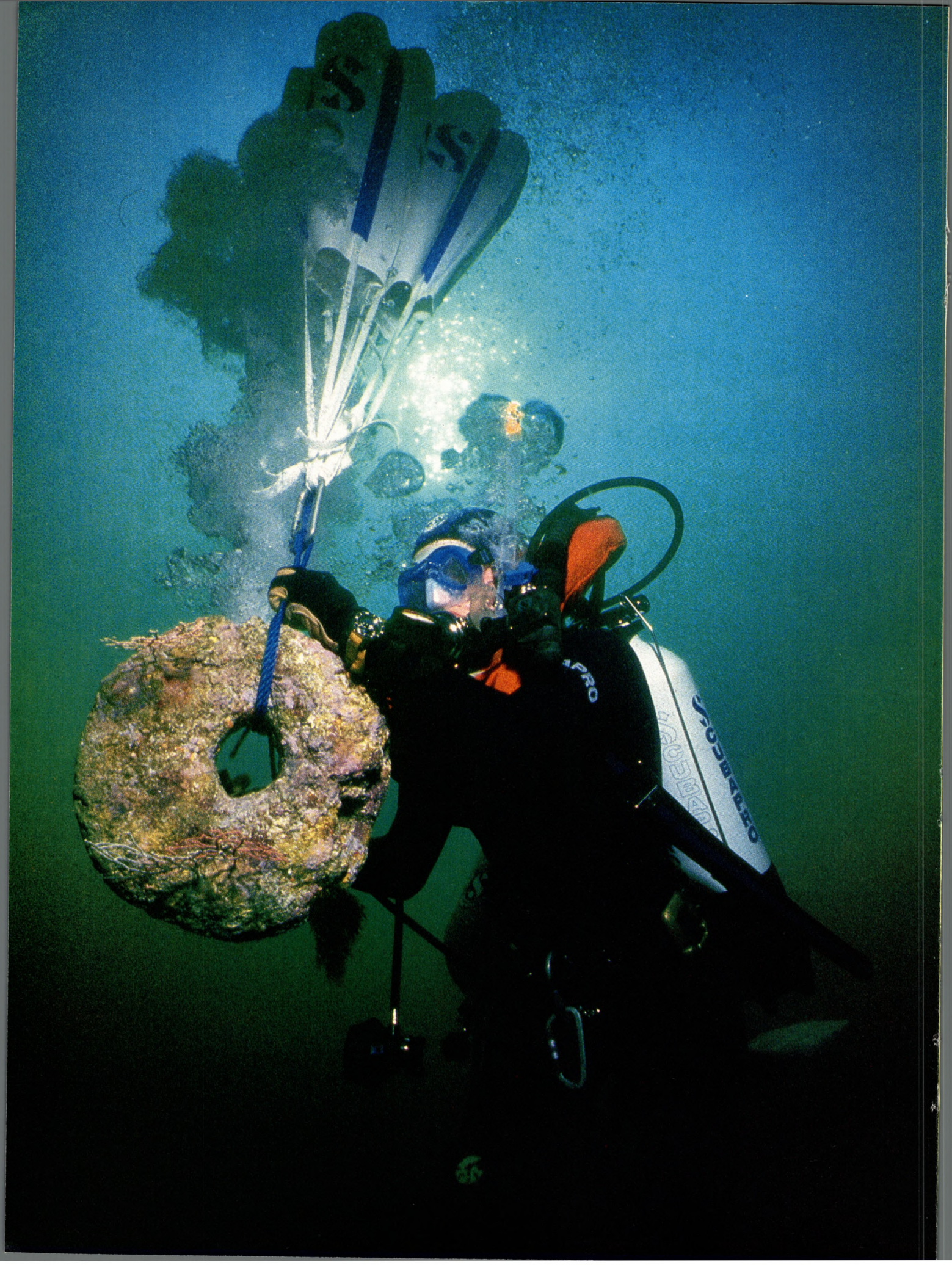
said to have saluted each rock they passed on returning from the sea. The salute consisted of raising high a liter of rough red wine!

When we reached the general area of Pil Coa, the sea was at low tide. We changed our course briefly to due East. I spotted a patch of smoother water from my position on the bow and quickly pointed to it. We slowly eased the boat forward. My brother Eric leaned over the side and almost immediately called for the anchor. We were soon moored to the top of the submerged islet which isn't more than 10 feet in diameter on the top.

"Are you sure we are the first ones to ever dive here?" Eric asks.

"Yes, I think so," I answer. This part of the coast isn't even visited by tourists.

My brother and I check each other's gear, stand for a moment face to face, exchange a wink and topple over opposite sides of the boat. The cloud of air bubbles dissipates and I can see the reef with its hairy skull. Large pieces of algae anchored to it wave in the swell. First we rig a buoy so we can easily return to the spot later. Then we choose a side of the peak at random, and descend to the bottom. It is a sheer drop. On the wall are pearly "roses des



mers," white and red gorgonians and large yellow sponges which bloom everywhere. All around, the water is the bottle-green color typical of Brittany.

After a 90-foot dive, we land on the rippled sand bottom. We turn back to the rock which stands like a fairy tale stronghold. Above, a school of black pollack looks like a flock of crows circling overhead. We swim West. The granite rock seems to be hewed with steps like tiers in an amphitheater. Our air supply is soon exhausted and regretfully we head for the surface satisfied with this first reconnoitering dive.

The following day, as the sun sinks into the sea, we load our gear quickly and head for the buoy. The air is heavy with the smell of the sea. A cormorant, with its neck outstretched, flies overhead. Our dinghy cuts the orange-colored sea like a chisel.

Once again on the bottom, the light is almost gone. Fortunately, I have an underwater light. We swim almost completely around the islet, examining its contours and the different plants that cling to it and the animals that call it home. This is definitely a first class dive. Hoping to find a lobster, we penetrate a small, dark cave. I switch on the light and the sponges which were blue, become purple. Finding no lobsters, we check our gauges and realize we both have only a few minutes of air left for the ascent. Suddenly, Eric grasps my arm like a madman. He forces me to point the light at the rear of the cave. A large stone wheel lies there, a hole in its center confirming it is man-made. My heart jumps in my chest. I have just enough time to fix and release an emergency buoy which I never dive without.

We return to the boat and on the way back in, we anxiously plan our next dive. The following morning we are back at our buoy and quickly over the side. Using a few lifting bags, we bring the wheel to the surface. Aboard the boat we examine this unusual find. The wheel weighs about 65 pounds and is covered with multi-colored marine growth. The wheel seems to be very old. It is about 16 inches in diameter and six inches thick. There is a perfect hole in the center and another on the side. One side is rough but the other is perfectly smooth. Is it an ancient millstone? A primitive anchor? How could it have gotten so far under the rocky overhang where we discovered it? Is it from the wreck of a ship now scattered by the currents? Many questions come to mind, but even now, few are answered.

During the days that follow, one of the divers in our group discovers the dolmen. At first, I can't believe him, but on the first dive, I am convinced. I dive again with Veronique and we clear off the algae which covers the dolmen. We don't find any engravings but feel more cleaning and careful search may turn up some. The point of the monument is on a bearing of 118 degrees — toward the rising sun. The small difference from East could be a change in the coordinate points from the time of its construction. What is most confusing is that this dolmen seems to be unique. None of those found in the area are like it. It is obviously hewed and a small man could lay on top of the slab. Could it be an altar? The dolmen does not rise more than a yard from the bottom. Could it be a sepulcher of an unknown sort? The dolmen is located in 80 feet of water — a sure sign of its early origins. The depth of the place and its distance from the coast should help in estimating the approximate date it was built. More than an estimate will be difficult as the megalithic civilization is nearly 6,000 years old.

The mystery beneath these cold, foggy waters has not yet been fathomed. No doubt scientists will soon offer preliminary answers to these exciting questions and, who knows, more tremendous discoveries may be made. $

Dolmens and Menhirs

Built in southern and western Europe between 6,000 and 3,800 B.C., dolmens and menhirs remain one of the great enigmas in the history of man.

Menhir means "stone pillar" and most often are made of granite. Menhirs are actually erected stones that can reach impressive measurements. The Kerloas en Plouarzel menhir is 10 meters high and weighs 150 tons. The broken menhir in Locmariaquer is 20 meters tall and weighs more than 350 tons! Those stones were carried several kilometers from where they were quarried. They were often placed in ovals or lines as the spectacular ones in Carnac where there are 1,169 of them.

Archaeologists tell us the men who raised the menhirs already grew cereals, worked with fired ceramics, ground and shaped stone and had some metal instruments.

The reason why the stones were erected is still a mystery. Some think they were primitive observatories used to forecast eclipses or record geodesic arrangements. One can more simply suppose they are religious monuments, linked to the main emblem for divinity of the primitive people — the sun which died and was reborn each day.

The dolmens are stone tables lying on rock columns. These megalithic monuments were used as graves and were devoted to dead worship, a ritual element of importance for prehistoric people. They prove a belief, if not in immortality, at least in metempsychosis or in reincarnation.

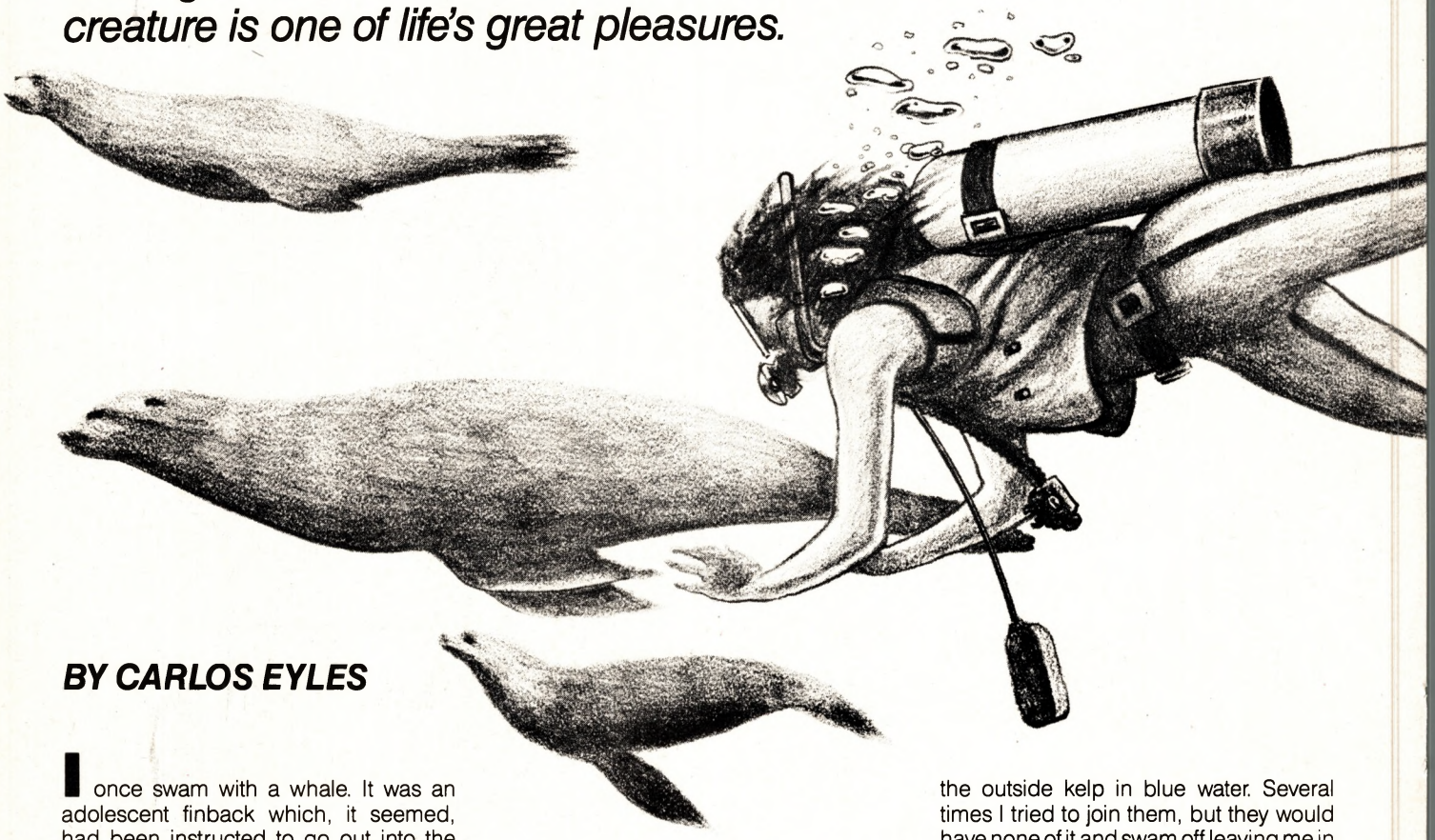
Most often, the dolmen was buried under a hill. The supports of the dolmen may be engraved. Many of the engravings seem to figure silhouettes or simplified parts of human bodies.

The number of bones and artifacts found at some sites infer that the megalithic graves were collective to the point that they held the remains of dozens, even hundreds of people, each of them being surrounded by familial, or personal objects and provided with food for the long way to the next world.

The dolmen of Pil Coa is a further mystery for historians because it is not only sunk in 80 feet of water — which implies it is far more ancient than the megalithic civilization — but also its shape is different from the "outside" dolmens and seems to be more carefully ground. Is it actually a dolmen? The question remains. What civilization raised this monument and for what purpose? Serious research yet to be undertaken should give us part of the answer. $

A Friendship Sealed

Making friends with a wild creature is one of life's great pleasures.



BY CARLOS EYLES

I once swam with a whale. It was an adolescent finback which, it seemed, had been instructed to go out into the world and encounter a human being. I was the fortunate objective of its quest. The magnificent creature allowed me to stroke it, make solid eye contact, swim and interact with it for close to 30 minutes. That meeting was the most enriching of the many experiences the ocean has provided me and remains one of the highlights of my life.

The contact with the whale was as uplifting as it was rare; whales like dolphins, are generally suspicious of humans and their good judgment is easily understood. Although I've tried many times since to interact — short of jumping on the back of a breaching whale — both dolphins and whales have been unresponsive to attempts. Still I search. The thrill I felt from that first exchange spurns me on.

My summer travels usually take me to the island of Catalina off the California coast. I like to spend several months anchored in various coves on the lee side and use my skiff to bounce around the island taking pictures, spearfishing, and in general living off the sea as best I can. This summer after anchoring my sloop in a new cove, I discovered several harbor seals occupying a section of rocks a 100 yards west of my anchorage.

In the early mornings and late afternoons, I would see them hunting along the extended points of the cove, working the outside kelp in blue water. Several times I tried to join them, but they would have none of it and swam off leaving me in their wake. Not wishing to press the situation and having plenty of time to ease my way into their good graces, I let it be. Besides, it was early summer and my mind was on the yellowtail and white sea bass that were beginning to make their runs from southern waters up past Catalina to their northern spawning grounds.

After a week of scouting, I discovered the yellowtails coming in off the west end and in my daily travels to that far point, I also discovered a large harbor seal colony a mile east of the yellowtail grounds. Generally the harbor seal colonies I've seen around the island are small; two, three and sometimes four to an area. Here at the west end, I count 12 seals dozing on separate boulders 30 feet from shore.

Carols Eyles was born and raised in Hawaii and is the author of "Diving Free," and "Sea Stalking," and a soon to be published diving novel, "The Last of the Blue Water Hunters."

Illustration by Nick Fain

A mature harbor seal is charcoal in color, sprayed with gray/black spots. The adolescents are a lighter gray and the very young are a solid white with gray spots. Marked as they are, the adults are difficult to see when resting on boulders close to shore. Viewed from more than a hundred yards, they tend to blend into the terrain and become just another lump on a rock. I was able to find this colony when I spied a bobbing head in the water that looked for all the world like a Labrador retriever enjoying a swim.

Intrigued by the large colony, I decided to try and make contact with them, reasoning that their numbers would favor a better opportunity. I approached them around midday, between their morning and evening hunts. To further increase my chances, I speared two bonito, a small one at three pounds and a large eight-pounder, so that I might bribe my way into their community. Anchoring the skiff 50 yards away from the sleeping seals, I enter the water free of a scuba unit. There is no need for one in the shallow water, I want to be as maneuverable as possible and move from surface to depth freely.

When I come to within 30 feet of the nearest seal, heads begin to rise from a dozen boulders and all watch as I slowly make my way toward them from the surface. One by one they slip off into the water, each seal progressively more frantic than the last, until the final few make a mad dash for the open water. Holding a fish in each hand I expect the seals to come in to me as aggressive sea lions had done in the past. But all flee and only three, that I could see in the 10-foot shallows, are curious enough to give me quick peeks while half hidden behind large kelp stalks on the bottom. I hang in an open area surrounded by kelp and wait. Every so often I make a slow dive to the bottom offering the bonito to any takers. Another five minutes rolls by before an adult seal slips up from behind and begins sniffing my fins. When I turn to it, the seal swims quickly away, eyeing me with uncertainty. Shortly a butterball of a seal, which must be the king of the colony, comes boldy toward me and unhesitatingly takes the larger bonito from my hand and swims away. Although it is not the kind of contact I have in mind, just offering a wild creature food and having it accept it, is contact nonetheless, and I am thrilled with the exchange. I hang around for another 20 minutes with the remaining fish but no further contact is made so I deposit the bonito on one of the basking rocks and leave.

Twice during the following week I return to the colony and the pattern is the same. When I near the seals, they dash off in a panic leaving me waving a fish in the empty water. I occurs to me that perhaps I'm approaching this from the wrong direction. Maybe I ought to try a smaller colony and reduce the potential for these frantic stampedes. Also, waving around a dead fish seems a bit unnatural, and I don't really like the idea of bribing the seals with food. If I am going to make contact, I would like it to be on mutual terms, not because I am a source of food.

I decide to concentrate on the three-seal colony near my anchorage, but the first two visits turn up empty — nobody home. The third visit finds the seals back on their rocks and I approach empty handed.

Treading water 20 feet from the nearest adult, it watches me from its dry rock, but does not enter the water. Instead a smaller seal closer to shore slips off its rock and cautiously approaches. It pops up behind me and then dives down to sniff my fins. Hanging unmoving in the water, I allow the seal to thoroughly inspect me. When it finally swims around for a clear view, I slowly make a dive to the eight-foot bottom. The seal does not dart away, but instead turns on its back as if offering itself in a gesture of trust. I do the same. When I return to the surface the seal is with me; contact has been established. Down

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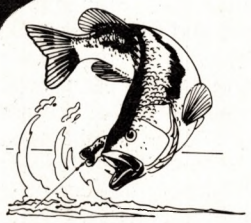

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again, the seal and I swim parallel along the bottom looking at each other. When I attempt to get closer it moves away, maintaining a distance of four to five feet.

The freedom of snorkeling allows me to stay up with the seal when it dashes off and then turns to wait, encouraging me to follow. The seal bolts away and hides beneath a rock outcropping, I discover its hiding place and we both head for the surface to resupply our lungs. I feel the seal is testing my agility underwater and becomes frustrated when I cannot keep up with it on lengthy swims. Eventually our play takes us to deeper water and my free dives have to stretch to 10 feet to keep pace. My bottom time is shortened and so is the contact. I try to entice the seal back to the shallows but it is reluctant to follow. After 40 minutes of spirited play, I reach the point of exhaustion and can no longer keep up. I stay on the surface hoping the seal will rejoin me, but the lack of activity on my part cannot hold its attention and the seal eventually disappears into the depths.

Three times in the next two weeks I make contact with the gray seal. We play as we had before, one on one, with the seal maintaining an arm's length distance from me. I cannot get close enough for a touch. On one occasion, I bring a female diver to the colony for a picture taking session. The additional diver altered the play some. The seal was willing to stay in the water with us and I believe it recognized me and a certain amount of trust had been established. But with two divers in the water, the distance from human to seal extended to six feet rather than the usual four feet. In an attempt to get some interesting shots I tried to keep the seal between myself and the other diver. The continual maneuvering made the seal leery and on two occasions I penetrated its "safe zone" and the seal made a lunge at me of several feet; clearly communicating my violation. It was the first aggressive gesture the harbor seal had shown and it was absolutely correct. The action was not enough to discourage play, but enough to inform us where its space of comfort lay. Otherwise, it let us shoot away and several times conveniently moved into six feet of water where the lighting was superior and resulted in better photographs. Eventually we ran out of film and energy and the seal, looking like a forelorn black lab, watched us return to our boat.

I continued to make occasional visits to the colony and was always welcomed and invited to play in the same manner as before, but I could only come so far, get so near, before the seal would swim away, keeping its distance. One day into the third week of my visits, I found two new seals swimming in the area, a white yearling and its full-grown mother. I did my usual routine of hanging in the water and

We play one on one, with the seal maintaining an arm's length distance from me.

allowing them to come in for a fin sniff. The yearling came to me immediately, sniffed, then swung around and faced me, making direction contact. The mother kept her distance and seemed unconcerned with my presence. There have been times in the past when aggressive lunges have been made by protective sea lions toward divers who have swum too close to their newborns, but this mother seal had apparently given us permission to play.

Unlike the adult who kept a lofty distance, the yearling shows no evidence of putting up a barrier. Up and down we dive, doing barrel rolls, upside down dives, hangs, spins and on almost every ascent the white seal accompanies me to the surface. While on the surface recapturing my breath, the seal comes to me face to face and I instinctively reach out my hand and touch it. It doesn't move away but comes closer and I begin to stroke its chest. That a wild, intelligent animal in its natural environment allows itself to be touched is, in many ways, the most meaningful sign of real contact. There is no other word to describe the moment other than magic. To reach out across the seemingly impenetrable barrier that separates man from the wilderness and make physical contact with an inhabitant of that world is indeed magic. I take off my glove so that I might feel its slick, yet coarse fur, and when I replant my hand on the seals chest it drapes one of its clawed flippers over my extended arm and we float there in the water in a half embrace.

It doesn't last very long, the young seal is anxious to get on with the fun of being a seal and breaks away to continue our play, but the moment has crystalized inside of me as it did with the whale. The experience changes you, it closes the distance between what is impossible and what is possible, it feeds the fire of understanding another life form and it sustains the hope that today might be the day. **S**

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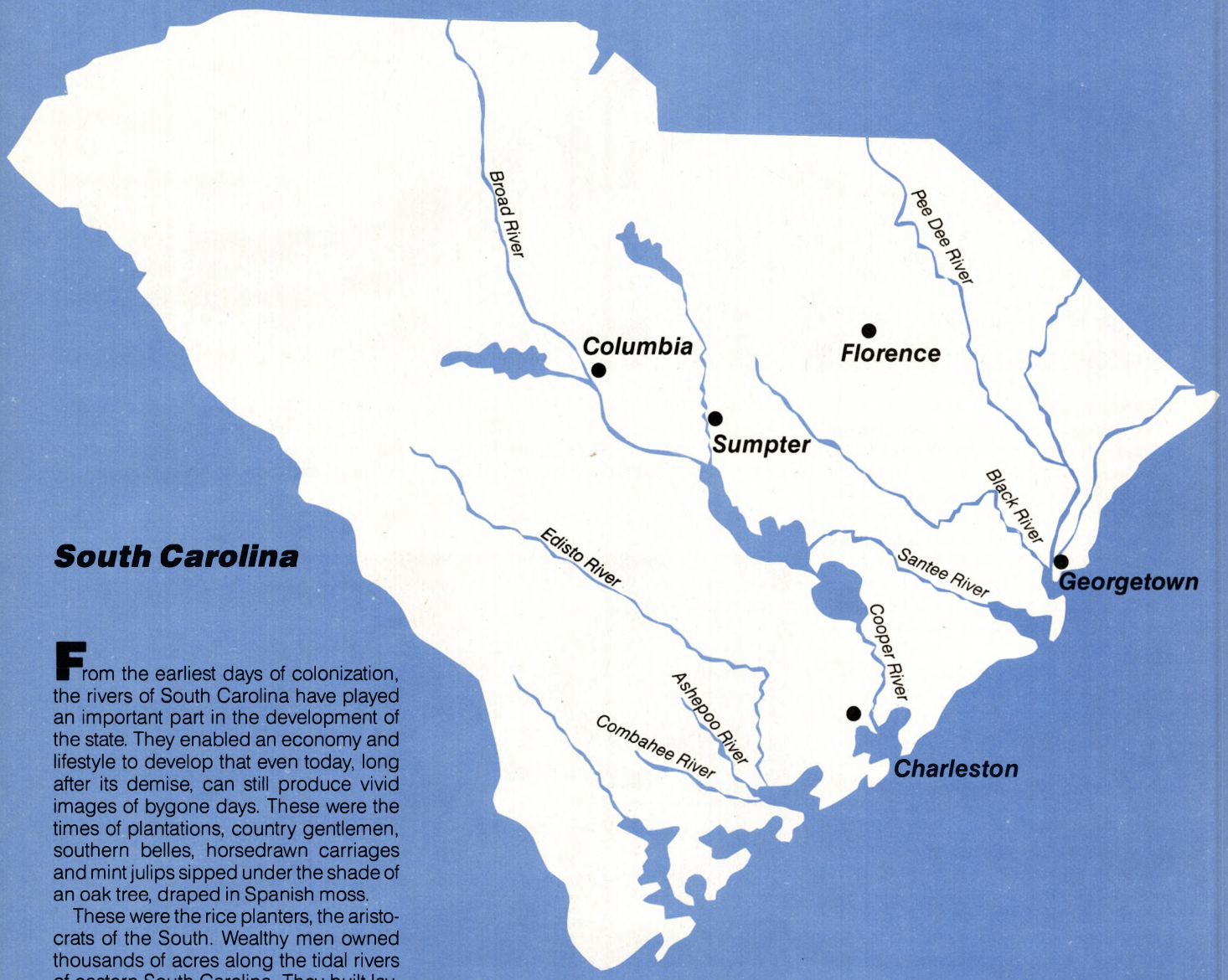
BY WENDELL PATTON III

Dixie River Dive

Tidal rivers yield relics of the Old South.



South Carolina

From the earliest days of colonization, the rivers of South Carolina have played an important part in the development of the state. They enabled an economy and lifestyle to develop that even today, long after its demise, can still produce vivid images of bygone days. These were the times of plantations, country gentlemen, southern belles, horsedrawn carriages and mint julips sipped under the shade of an oak tree, draped in Spanish moss.

These were the rice planters, the aristocrats of the South. Wealthy men owned thousands of acres along the tidal rivers of eastern South Carolina. They built lavish homes, some of which are still in use today.

The rivers were the lifeline of those times. They provided the necessary flooding of the fields for the rice and practical transportation of the harvest to the major ports and markets. Boats traveled these waterways daily. Some were barges powered by oars while others were powered by sail. Although some of these barges were plank built, most were dugouts. They averaged about 30 to 40 feet length, with 8-foot beams, 10 oars and two sails.

The era of the rice planter reached its peak between the years 1850 and 1860. At that time, on only 10 rivers; the Waccamaw, Pee Dee, Black, Sampit, Cooper, Edisto, Ashepoo, Combahee, Santee and the Carolina side of the Savannah, there were a total of 227 rice plantations! And these were not small operations. On the Edisto River alone, the average plantation size was in excess of 500 acres.

Then came "The War." The plantation men raised troops, commanded their own regiments and left to defend their homeland just as their forefathers had done a century before. But now they were rebels, not the patriots their grandfathers were who fought for the same land. The river boats were replaced by troop ships and gun boats manned by the Yankees. Up and down the rivers these ships sailed. Encounters with Confederate shore batteries or snipers were common. As the Federal grip tigthtened and the Confederate cause weakened, more troops appeared. Entire plantations were destroy-

ed or fell into ruin. When the people fled, silverware and other precious belongings were hidden for safekeeping. Much of it ended up in the rivers. Better that than allow the Yankees to take it.

When the war ended, Southern planters who had survived attempted to rekindle their former lifestyle. But the lack of capital for mechanization, a fading labor supply and the introduction of rice into Louisiana sounded the death knell. The golden age of the early South became just a memory.

For the diver, however, these historic rivers still flow today and are a virtual treasure chest of artifacts of the past. Treasures which cover a period of 20 million years. These rivers flow over fossil beds that yield remains of animals that swam in oceans that inundated the entire eastern half of South Carolina four times in the last 1 million years alone.

Then came the Indians who lived and died here and left traces of their existence on the river bottom just as the rice planters would do centuries later. There also are the relics of both the Revolutionary War and the Civil War. And finally there are the disgards of modern man who used ferries to cross these rivers up until the 1950s.

By far the most popular South Carolina river for divers is the Cooper River. A large river fed by the famous Santee-Cooper lakes of Marion and Moultrie, it begins East of Moncks Corner and enters the Atlantic Ocean at historic Charleston. Best known for its fossil beds, the Cooper has yielded artifacts from past generations with amazing regularity. The fact that better than 40 plantations graced its banks certainly helps to account for this.

For most local divers, fossils are reason enough to spend hours exploring the Cooper. Shark's teeth are the biggest attraction. These teeth can range in age from one to 20 million years old! A tooth 6 inches from base to point is not an uncommon find. Most range from 2 to 4 inches and are not a bad find. Other finds will include fossilized whale's ears, horse teeth, whale vertebrae, mastadon teeth and many others.

The Cooper fossil beds are also prime sources for relics from man's past. Most of the river bottom composition is hard clay which does little to stop a relic from rolling along the bottom. The fossil beds look much like an area that someone has used to spread a load of coal. This outcropping of sedimentary rock tends to stop anything rolling across its surface. Clay pipes, pottery fragments and chert points are commonly found.

The Cooper differs from some of the other rivers in the state in several ways. It normally has better visibility, usually around 10 feet. But at times it can be even better. Because it is such a large river, it is also deep. Most of the popular dive sites will average about 40 feet, but there are places that will exceed 80 feet. The best diving on an incoming tide. Check the tide tables for Charleston. The best time to plan your dive would be about two hours before high tide in Charleston. The incoming tide slows the river's natural current down enough to make for a very pleasant dive. You will have more than enough time to burn up several tanks of air or even dive more than one site. I do not recommend trying to dive the river on the outgoing tide. The current is simply too swift.

Photo by Flip Nicklin

If you aren't one to follow the crowd to the popular "goodie holes" at the Cooper, don't despair because there are other low-country rivers that are also diveable.

On the northeastern coast of South Carolina is the resort area of Myrtle Beach. Through this area run two of the prettiest blackwater rivers you will ever see. Both take their names from the Indian tribes that lived along their banks. The rivers are the Little Pee Dee and the Waccamaw. Both are relatively shallow with clay and sand bottoms. Of particular historical interest is the fact that the Little Pee Dee had cotton plantations gracing its shoreline, not rice as was common elsewhere in the state.

Following the coast south you will come to the town of Georgetown. Here you will find the Black River. At its upper end is Kingstree, S.C. which was a trade center long before the Revolutionary War. Indigo, grain, flax and lumber were harvested and traded here. Riverboats regularly traveled this far upstream. Closer to Georgetown is the site of a ferry crossing known as Brown's Ferry. It was here that a scuba diver located a wreck that has come to be known as the "Brown's Ferry Vessel." The find was reported to the state which sent a team of archaeologists to investigate. It was determined the find was a 40-foot riverboat sunk in 1740. What made it historically significant, particularly to South Carolinians, was that the boat was of planked not a dug out, and that it had been made within the state! Its beam at the widest point was 14 feet and it had a

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BY DAVE WOODWARD

Let There Be Light

The right way to use an underwater strobe.

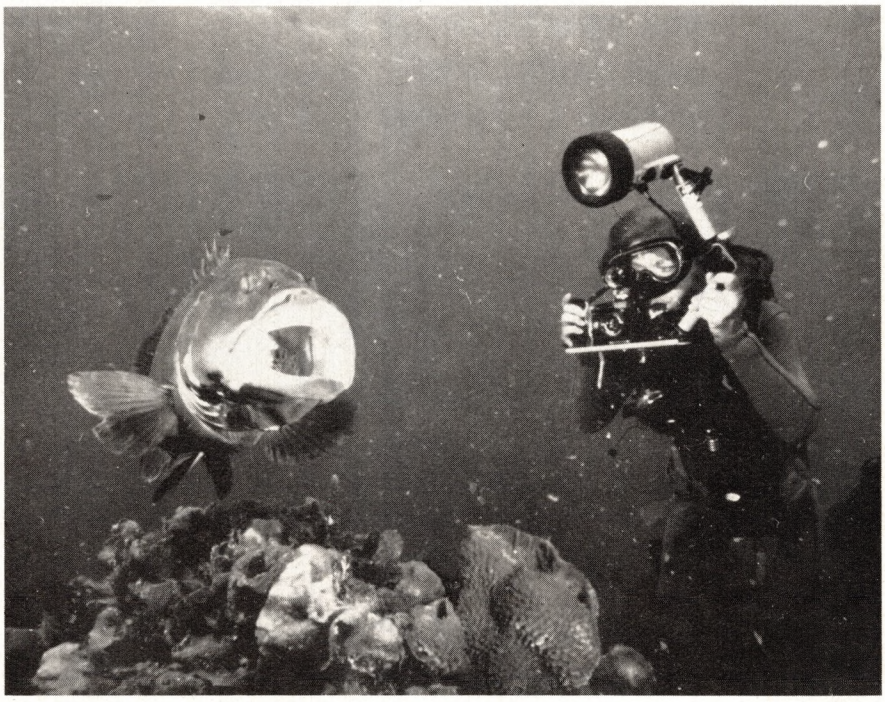
Give a cheer and raise your glass! Blessings on thee, Joe Flynn!

Who is Joe Flynn? Why, only the great emancipator of underwater photographers! Uncle Joe freed us all from the slavery of flashbulbs. His first Sub Sea Strobe, produced little more than 16 years ago, gave us, for the first time, dependable flashes every five seconds. No more wrestling flashbulbs out of a mesh bag. No more frantic pursuits of runaway bulbs and bags zooming toward the surface. No more cut fingers while hopelessly pushing and twisting the broken bases out of the bayonet holder. Indeed, Joe lit the way to present-day underwater photography. Blessings on you, Joe Flynn!

"But, wait a minute, what's all this fuss about strobes, you ask?" If you are new to underwater photography your question is valid. To understand the problem, let's take a look at what happens to light as it enters the water.

Water affects sunlight in two ways. First, particles in suspension in the water refract light rays, causing diffusion and loss of light as the diver goes deeper. Even in the so-called "gin clear water" of our best diving areas, the visibility rarely measures more than 100 feet, which would be a thick fog above water. Sunlight loss in these conditions usually measures about one aperture opening on your camera for every 15 feet of depth. However, this is not the only problem.

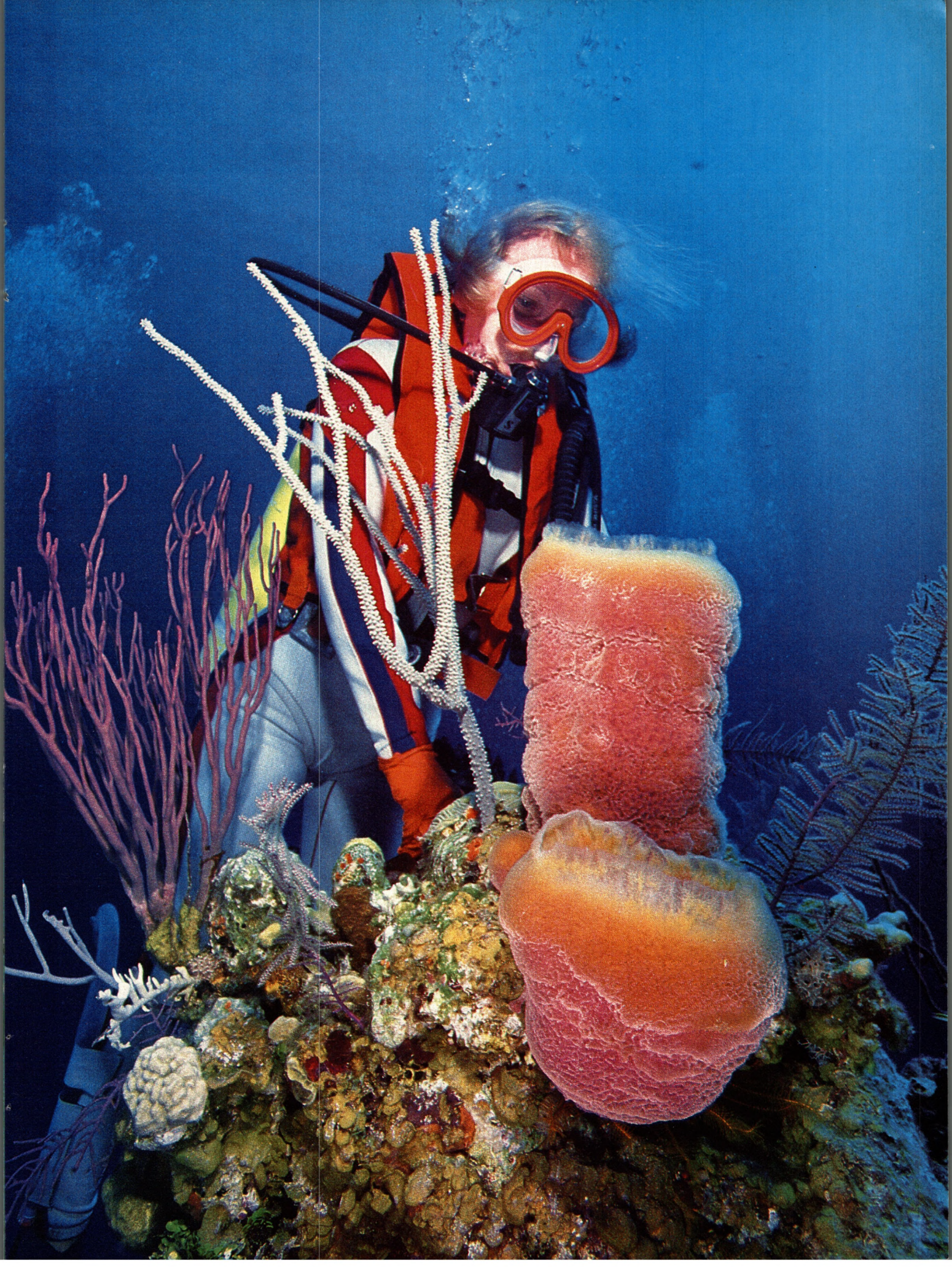
The rapid loss in light quantity as we dive deeper is also accompanied by a change in light quality. The shorter rays in the spectrum — reds and yellows — are absorbed by the water itself, leaving only the green and blue lengths. This quality change is so rapid that at 20 feet almost 50 percent of the red light is absorbed and 25 percent of the yellow.

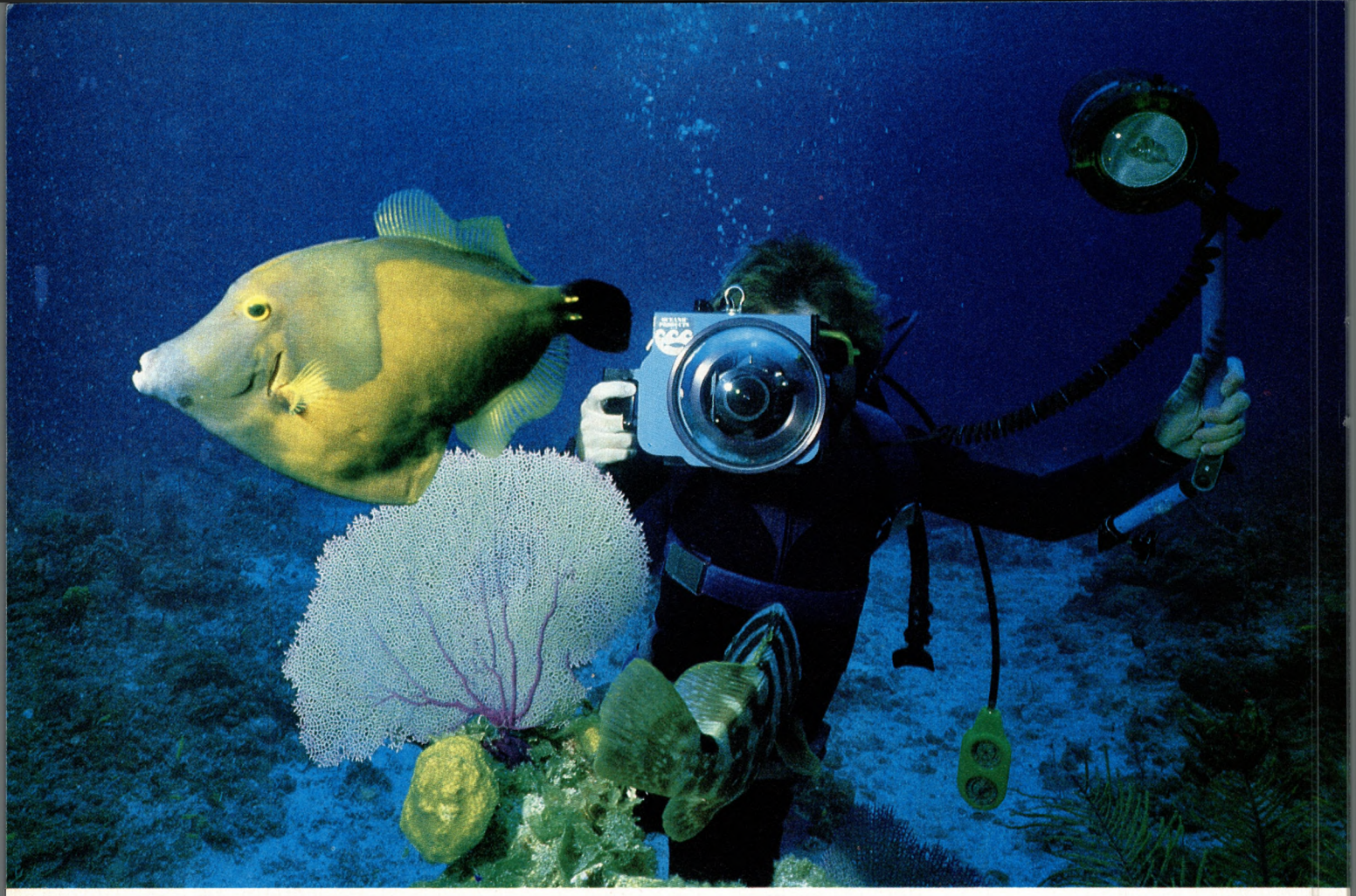


Strobe lights brought underwater photography out of the Dark Ages.

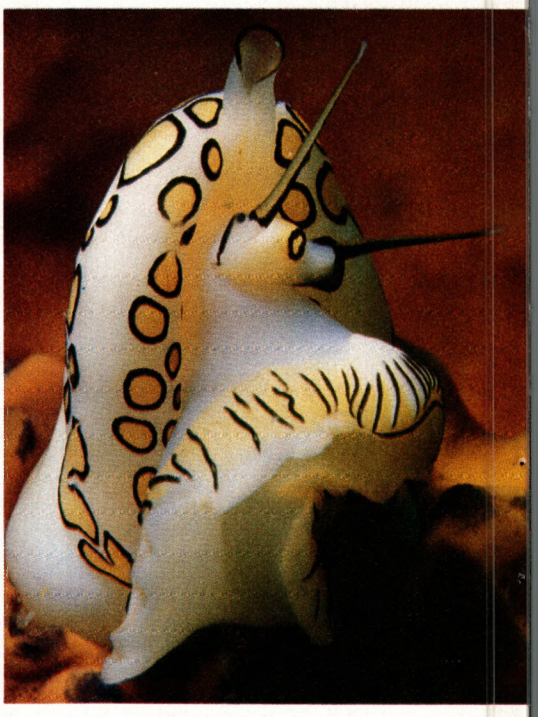
To minimize these problems in underwater photography we encapsulate a small bit of sunlight with the help of batteries, transistors, condensers and glass, and submerge it with us to help illuminate the scene. Naturally, this stolen sunlight is subject to the same physical laws as its progenitor. It is absorbed, diffused and reflected. These physical limitations are so severe that in order to illuminate a subject with a sufficient quantity and the proper quality of light, it's necessary to shoot a picture very close to the subject. If you place the camera and strobe five actual feet from your subject and shoot, the strobe light travels a total distance of 10 feet before exposing the film. The 10-foot travel distance allows the water to absorb 25 percent of the red light, dramatically altering the appearance of the subject. If the subject is a person, the skin tones will appear blue or green. For pinkish skin tones, it is necessary to move within four actual feet or less before shooting. The closer you are, the redder the scene.

Good underwater photographs, excepting silhouetting and dramatic shapes, depend upon well illuminated, colorful subjects, tastefully composed, and taken within the range of four actual feet or less. Pictures taken at greater distances will suffer problems of color,





Above, diver hand-holds strobe which requires careful aiming to create the desired effect. Below left, a grouper being cleaned by a goby is lit from above as is the flamingo tongue snail.



sharpness and illumination. Those great wall shots of people and larger objects which show strong red saturation are obviously taken with wide angle lenses at distances less than four actual feet.

Now, before you jump in and fire away, let's talk about proper illumination. How do you determine the correct aperture for proper exposure? You could of course just use an automatic camera and strobe and forget the worry about aperture setting. If a 60 percent return on shooting is satisfactory and mechanical pictures are pleasing, then that's the easy way out of the dilemma. Creative photography, however, requires manual equipment. The careful application of the following techniques should give you 75 to 90 percent accuracy.

Sharpness and exposure depend upon good distance judgment.

Flowers of the sea or feather dusters, are seen in a close-up photo.

Proper exposure is really a subjective term, and often "proper" is only in the eyes of the taker or viewer. And, unfortunately, "proper exposure" does not always make the best picture. Your photos may tell different stories about the same scene by using variances in both light intensity and angle. Generally speaking, when taking slide pictures, it is better to underexpose the film by ½ to ⅓ f-stop to gain greater color saturation.

The first decision to be made concerning exposure is what film to use. Kodak's recent addition of Ektachrome 100 to its line has complicated the film scene. By blending the ease of Ektachrome processing with the grain and color saturation of Kodachrome, it would seem we now have the best of both in one film, plus greater speed. There is no doubt that 100 is an excellent film with its stronger red saturation, finer grain, and retained delicate blue saturation, plus its two-thirds faster speed. However, nothing is gained without sacrifice. The faster speed has also brought greater contrast and a narrower exposure latitude. Greater contrast means less shadow detail, and narrower exposure latitude requires more accurate exposure determination.

Ektachrome 64 is still available in 100-foot bulk rolls. When it is carefully processed with mechanical agitation, it produces lovely saturated colors, softer contrast, and more forgiving exposures than the 100. However, this film is more sensitive to age and temperature color changes, and must be treated with great care.

Since the majority of underwater photographers seem to be using Ek100, the following exposure recommendations are based on this film. To adapt them to ISO/ASA 64 film, open the aperture from ½ to ⅔ of a stop. Although the film speed difference between 100 and 64 is actually ⅔ of a stop, it's my personal opinion that the actual difference is only a half stop. By experimenting, you will arrive at your own opinion.

The below listed, beginning exposures, are also based on optional or apparent distances, since the majority of underwater photographers are using the Nikonos system. Remember that the Nikonos is a "guess-finder" camera. You must guess how far away your subject is in optical distances (16 actual inches per optical foot) and set the lens focus accordingly before shooting. The lens focus markings are based on optical distances, not actual. If you are an experienced diver you have reprogrammed your brain for actual distance determination once you are close to touching distance. Otherwise you would not be able to reach out and touch an underwater object without gropping. In taking a picture at three feet you are more likely to place the camera at three actual feet than three optical, a variance of 12 inches. With an aperture setting of F8 or 11 your picture will not be sharply focussed.

There is a simple shortcut to sharp, properly exposed pictures — the three-foot stick. This is a 48-inch long by ½-inch aluminum tube, with a heavy nylon wrist string. Wrap black plastic tape at 16-inch intervals, marking off each optical foot. This stick, placed gently on the center of your subject and against the body of your camera, gives you the three optical foot setting for perfect sharpness and consistent exposure. While this may seem awkward to carry at the start, its use will assure you of immediate success. It is also invaluable for poking critters out of holes, pushing off the bottom, etc.

Don't use it as a crutch, however, but as a reprogramming tool. Start off taking pictures at three feet, using the stick to position yourself. When this begins to feel comfortable, start placing yourself without the stick. Then use it to double-check the distance. It shouldn't take more than a roll or two of film to become consistent at three optical feet. Once you are consistent at judging this distance, you are ready to accurately judge closer or farther away, as well as moving subjects. Don't forget that the Nikonos 35mm lens will focus no closer than 2½ optical feet (42 actual inches). Obviously, sharpness and exposure depend upon good distance judgment.

A wide variety of strobes are available, and some are more or less powerful than others. It is possible, however, to generalize at a starting exposure that will, by experimenting, give you proper exposure. At three optical feet, the average large strobe, using Ek100 film, should result in a camera aperture setting between f8 and f11. Strobes such as the Ikelite 225, Sub Sea 225 & 300, Oceanic 3000 series, and the Nikonos 101 & 102 are all ½ to 1 stop stronger, and this must be taken into account. These settings are, of course, just a suggested starting point. Even strobes of the same manufacturer and model number will not be exactly the same, so experimentation is necessary. On your test roll, shoot four different apertures, starting at f8 and using ½-stop increments. Naturally pick a subject that is stationary, and has average reflectivity. Fortunately, most colorful objects of medium hue have average reflectivity, so it shouldn't be too hard to find a suitable model.

If you want consistently well exposed pictures don't omit this procedure. Once you have established the correct exposure for three optical feet, it is easy to determine aperture for other distances. For each optical foot of distance change either side of three feet, open or close the aperture one stop per foot. Remember, as you come closer to your subject, its reflectivity becomes more critical, and if you are in doubt it's always wise to bracket your shots. To do this take at least three photos. The first shot should be at the suggested aperture, but for the next two, open ½ stop and close ½ stop.

No photographer is so good he or she can get the definitive picture of a subject with one shot. Good subjects, despite the proliferation of reef life, are few and far between. When you find one make the most of it. Try different angles and intensities of illumination. Make each shot the best you can.

Interesting pictures require the creative use of light. Where should the strobe be placed in relationship to the camera and subject? The strobe is of course a pseudo sun. Its angle of attack throws subject shadows in the opposite direction. Experience and tradition tells us the most natural subject angle of illumination is with the source of light coming from the upper left of the picture, throwing shadows down to the lower right. This is the position in which most strobe units are placed.

During your first attempts at underwater photography, it's wise to leave the strobe attached. But, as the camera becomes your third eye, the hand-held strobe becomes imperative for creative lighting. However, most strobe arms do not lend themselves to accurate aiming when hand-held. You also have two items of equipment to aim at one subject. At first your percentage of well illuminated pictures will decline drastically. Concentration and perseverance will, however, prevail. Practice! Even walking around and dry shooting will be of help. Position the camera and hand-held strobe and then glance up to the left at the strobe face and correct its position. Concentrate on the feel. Think about how your hand, wrist, arm and shoulder feel when the strobe is aimed properly. Accuracy underwater will follow rapidly and you will find yourself change strobe angles to tell different picture stories.

Normal, or proper exposure also requires that the strobe face and camera lens be equidistant from the subject. By placing the strobe face one foot closer or farther away than the camera, you can automatically change the power of the illumination by ½ stop, softening or intensifying the exposure. This is an easy way to compensate for a moderate reflectivity variation in your subject, rather than having to stop and change the lens setting. Two feet of strobe face change is possible, but may require placement of the strobe farther to the side of the camera to prevent lens flare and appearance of the strobe in the picture. This of course depends upon which Nikonos lens you are using.

There is a third advantage of the hand-held strobe that is also important. The farther the strobe is from the camera, the less likely bounce-back off suspended particles between the subject and the camera lens is to occur. The closer the strobe gets to the lens, the more bounce-back you will get. The minimum distance between strobe face and camera lens at a camera-to-subject distance of three optical feet is 18 actual inches. Of course, the farther away the strobe is, the more lateral the lighting becomes, increasing subject shadow size, and decreasing frontal illumination. There has to be a compromise.

So, enough of words, it's time for deeds. Load the camera, charge your strobe, and expose yourself and your film to the sea — and enjoy. $

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BY O. vulgaris OLIVER
As told to DEE SCARR

I, Oliver

A reef resident offers some tips to photographers.

The north end of a scralwed filefish traveling south . . . The tube of a Christmas tree worm . . . The space in the blue water where an arrow crab had been before a Spanish hogfish came along and gobbled it up . . .

From what I've observed, lots of underwater photographers have shots like these. Although I can't believe they're the shots the photographers wanted! But I'm just an octopus. You can call me Oliver. I've spent a lot of time watching divers and I think I can offer a few suggestions to underwater photographers that will result in better pictures. There might also be some benefits to the reef and its inhabitants, but my main concern is you and your pictures. We octopuses are very unselfish.

First of all, lots of people start carrying cameras around before they're really comfortable with all the equipment you humans have to wear to dive. They spend a lot of time crashing into things, like coral heads and octopus homes. The wetsuit they spent a lot of money on doesn't last very long when they're constantly dragging it over sharp corals.

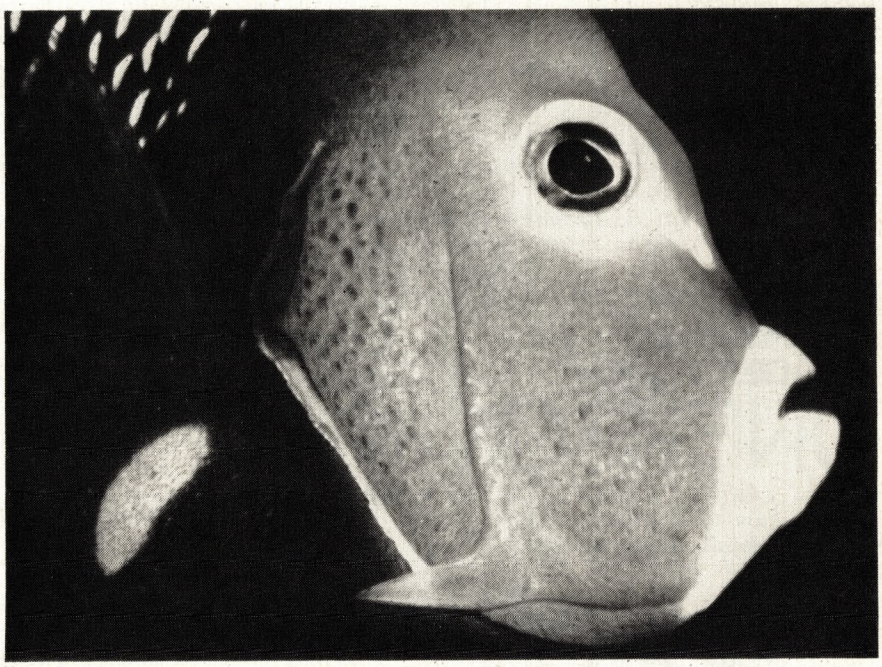
I know a better solution: good buoyancy control. Fish like angelfish or trumpetfish can hover in one place because they have air bladders — internal versions of the buoyancy compensators you divers wear — and they adjust the gas in their bladders until they can stay right at one level in the water. Fish, of course, have 24 hours a day to practice and a lot of instinct to guide them, but people (much as I hate to admit it) are a lot smarter than fish and with a little effort can learn to hover just as expertly. One of my favorite people to watch in the water is a guy named Rick Frehsee, who I understand is a pretty well-known underwater photographer. I wasn't surprised to learn he took terrific pictures because he floats so gently just above the reef, he looks like he belongs there. He doesn't need any protection from the coral because he never touches it; he just hovers about one small octopus tentacle above it to take his photos. You should watch him if you ever have the chance.

Being neutrally buoyant in the water will save you a lot of wear and tear on your skin and your suit.

Are you thinking: "Hey, I like to be heavy in the water. I don't crash into things because I just kick to stay above the bottom?" Okay, Smartie, I have two questions for you: Why is your air consumption so bad and why do you have so much backscatter in your pictures? The answers are: Your air consumption is rotten because you're working — kicking — all the time. That, by the way, is one reason why your air consumption increased when you started carrying a camera. I'll bet you used to scull with your hands all the time.

And second, when you're just above the bottom in a vertical position and kicking, you're stirring all the sand and silt up — right in front of your camera.

Don't get me wrong. We octopuses don't have air bladders, so I know how nice it can be to rest on the bottom. How could I concentrate on opening a clam if I was floating all over the place? It's just that if you rest on the bottom *hard,* you're not doing yourself any favors. Just last week I watched a negatively-buoyant diver firmly brace himself on the bottom to photograph a sponge. As he composed the picture, he noticed a manta ray swimming toward him. The diver leaped up and kicked furiously but he was too negative to get into position before the ray passed. When he went back to the sponge, so much sand was stirred up the picture wasn't worth taking.



A food handout lured this French angelfish close to the camera.

Another time I watched a woman in hot pursuit of a barracuda, camera at the ready. She kept hitting the bottom with her fins, which she didn't care about since the silt was kicked up behind her, until the 'cuda turned around and gave her a perfect pose right in the middle of the cloud of silt she'd kicked up!

Speaking of chasing things, Dave Woodward says, "If you chase fish, you

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Operator of "Touch the Sea," a personalized dive guiding service based on Bonaire, Dee Scarr is a free-lance writer and author of "Touch the Sea."

get pictures of fish tails." And I say, "If you chase octopuses, you get pictures of ink!" You probably already know that, though. So the question is, how do you get fish portraits?

One way to start is to hover in the water and watch. When you find a subject you like, stay 10 to 15 feet away from it at first, watch its swimming pattern, and slowly approach it from an angle between head-on and broadside. If your approach is smooth and slow, chances of getting close enough for a good portrait are improved. Also, approach your subject from as low a position as you can as predators usually come from above. So if you swim downward toward a fish, you're likely to frighten it — plus photos shot at that angle are disorienting. Angling the camera upward results in a more natural perspective.

The lettuce sea slug is at home on an algae-covered branch of a staghorn coral.

Another way to improve fish portraits is with the help of your buddy or dive guide. If they hand-feed some fish, you'll have ready-made subjects for your pictures. Remember, though, that even if a fish is concentrating on the food, it will be frightened if you thrust the camera at it or move a big strobe suddenly. Move your camera and strobe slowly. And, again, before you start to shoot spend some time watching what the fish do so you'll be able to anticipate their movements and save a lot of wasted film.

If all this sounds like a lot of work — it is. Some people take up macro photography because they believe it's easier. I want you to know it takes a great deal of self-discipline and inner strength for me to discuss macro photography at all, but it needs to be done and we all know octopuses have lots of self-discipline and inner strength. You didn't know that? Well, take my word for it or watch an octopus protect his house from a moray eel.

Why don't I like macro photography? Consider what it's like to be sitting calmly in my den and suddenly somebody sticks a framer with those bars on it right into my face! Yuck! If I wasn't so fast I'd have lost an eye!

Another time I watched someone pick up a nudibranch — they're my cousins, you know — and try to pose it. First he placed the nudi on a coral head, but it scrunched up and wouldn't stay put. He then stuck it down on the coral a couple of times (scraping the coral with the framers) but still couldn't get it to stay put, so then he tossed it up into the water and it almost got eaten by a yellowtail! All that saved my cuz was that yellowtails don't like the taste of nudibranches. Anyway, with all the yellowtails zooming around the photographer couldn't get his shot so he left with the poor nudibranch still floating perilously up there!

Please, when you're taking pictures, think of the animal too! Invertebrates live in protected places; if you must move them it only takes a second to put them back home. If you *must* move an animal, put it where it's comfortable. For example,

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a nudibranch won't naturally crawl on living corals, and most nudis are very uncomfortable off the bottom. How to get a good shot? Pose the nudi on some nice algae that contrasts to its color. If you put it on the edge of the algae, you can get a nice profile, too. And it's perfectly comfortable there.

If you swim down toward a fish, you'll likely to frighten it.

Another example is the arrow crab. Lots of people like to toss them up into the water to photograph them. Nudis aren't too palatable but lots of fish will eat arrow crabs; so a tossed-up arrow crab is about as terrified as an arrow crab can get! Even if you got the picture, the crab will have all his legs up in a cluster to get to the bottom faster and all you've got is a picture of a terrified crab. Why not shoot it against the urchin or the anemone it lives near, or at least pose it against something like a sponge?

Here's another thought. At night, arrow crabs (and lots of other invertebrates) leave their hiding places to forage. You could get a nice shot of an arrow crab poised on a sponge or gorgonian, and you wouldn't even have to pose it! It would be a shot of the critter behaving naturally, too.

Christmas tree worms are so pretty that everyone wants pictures of them — but they sure are shy! One reason they zip back into their tubes is that some photographers try to brace their framers against the coral heads where the worm lives. As soon as the worm feels the framer hit the coral, it retracts. In addition to losing the subject, the photographer also might bend the framer or damage the coral. A more successful approach is to hold the framer at the tips of the Christmas trees. This is less frightening for the worm, the tips of the trees are in better focus, and the coral and framer remain unscathed.

You can even take closeup shots of fish with your extension tubes, especially if you're steady and patient. Have your buddies feed the fish, holding the food at an inner corner of the framer. This way the fish comes to you. What doesn't work is when the photographer tries to move the camera system to the fish. That just scares the fish. Those framers are nasty when they're shoved at you!

Dee says if I'm going to force all these suggestions onto you, the least I can do is tell you how to photograph an octopus...

We're pretty shy and retiring most of the time, but we are curious. How else would I have learned so much about underwater photography? The best time to find an octopus out of his or her den is, as you probably know, at night. That's very true of Octopus briareus, but you can find O. vulgaris — that's me — out in the daytime if you have a good eye. All us octopuses stay on the bottom when we're walking around to keep an eye out for our predators above us. Therefore, we feel a lot more comfortable when you approach us as low as possible. As soon as your light falls on him, O, briareus will slip into a crevice if he can; if not, he'll spread out to look bigger. That makes a nice picture although the octopus isn't completely comfortable. If he's really scared, he'll ink and leave. That's a good time for you to search for an arrow crab or something.

If I see divers when I'm out of my house, my first thought is to find a cozy hiding place. Unfortunately, when I'm hunting on sand and rubble flats, there aren't too many hiding places around, so sometimes my best option is to disappear. This, of course, is impossible for a diver to do, but for an octopus it's easy. I flatten my body against the bottom or a coral head or something, create texture and color to match, and stay very still. It's great! Divers have passed right over me and never even known I was there! But don't feel bad; we really are experts at this; we fool all our predators this way.

On the other hand, if you do notice me, it's a perfect time for you to take pictures because I guarantee you I'm not going anywhere unless you grab me or something, in which case I'll ink, zoom off, and disappear somewhere else. You might notice that I flinch every time the flash goes off — don't you hate it when a flash goes off in your eyes? So I'd appreciate your limiting your enthusiasm if you can. Anyway, it's really a nice pose and when you show off your pictures, you can test your audience by asking them to find the octopus. Won't you feel superior when they beg you to point me out? Oh, and could you make me a couple of 3x5 prints?

I can summarize what I'm trying to tell you in one sentence: To get good underwater photographs, you need to fit into the environment and think about your actions from your subject's point of view. Since the pictures I borrowed from Dee for this article were all taken by following that advice, you can decide for yourself whether it's worthwhile or not. Dee thought I should use some of the pictures I've shot myself, but I figured it would be more tactful to use photographs by one of your own species. There's a degree of excellence only attainable by those of us with eight arms, and it didn't seem fair of me to offer you a challenge you couldn't meet. $

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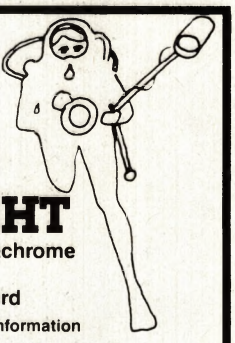

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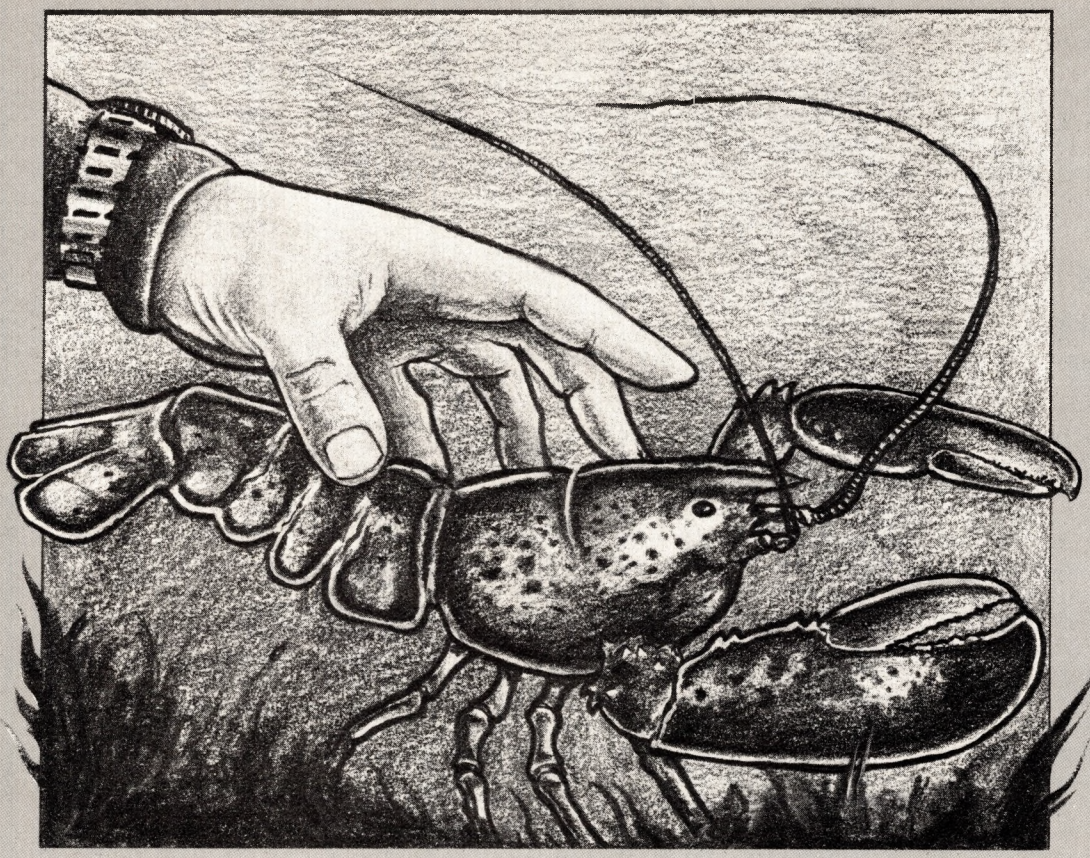

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Grant Azbell's Outdoor World
1525 Broadway St.
Sheffield 35660
(205) 383-2930
Monday-Saturday: 9 to 5

Gulf Gate Lodge
Hwy. 180 E, PO Box 308
Orange Beach 36561
(205) 981-4678
Daily: 6 to 5

Skinny's Scuba Shack
1215 Center Point Rd.
Birmingham 35216
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Wasilla 99867
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Hot Springs 71913
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Saturday & Sunday: 9 to 5

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N. Little Rock 72114
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Reseda 91335
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Fresno 93726
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557 Milwaukee
Denver 80206
(303) 399-2877
Monday-Friday: 10 to 7
Saturday: 10 to 6

Diver's Reef
3014 N. Nevada
Colorado Springs 80907
(303) 634-3366
Monday-Saturday: 10 to 6

Rocky Mountain Diving & Sailboard Center
1737 15th St.
Boulder 80302
(303) 449-8606
Monday-Friday: 10:30 to 6:30
Saturday: 10 to 5

CONNECTICUT

Swim & Dive Center (Multi-Tech)
190 Flanders Rd.
Niantic 06357
(203) 739-9596

DISTRICT OF COLUMBIA

National Diving Center
4932 Wisconsin Ave. N.W.
Washington D.C. 20016
(202) 363-6123
Monday-Friday: 9 to 8
Saturday: 9 to 5
Sunday: 10 a.m. to 4 p.m. (5:30-10:30)

FLORIDA

ABC Sports Inc.
1915 Linhart
Ft. Myers 33901
(813) 334-4616
Monday-Friday: 10 to 5:30
Saturday: 10 to 3

Adventure Diving, Inc.
3127 S. Ridgewood Ave.
South Daytona 32019
(904) 788-8050
Monday-Saturday: 9 to 6

Ameri Dive
7166 Beracasa Way
Boca Raton 33433
(305) 395-4407
Daily: 9 to 7

American Diving Headquarters Inc.
Route 1, Box 274B
Key Largo 33037
(305) 451-0037
Daily: 7:30 to 6

American Diver's Int'l
691 N. Courtenay Parkway
Merritt Island, 32953
(305) 453-0600, 0601
Monday-Saturday: 6 to 9

Aquanauts South
919 S.W. 87th Ave.
Miami 33174
(305) 262-9295
Monday-Saturday: 9 to 7

Aqua Shop
1940 Broadway
Riviera Beach 33404
(305) 848-9042
Daily: 8 to 6

Aquatic Center Inc.
2126 S.W. 34th St.
Gainesville 32608
(904) 377-DIVE
Monday-Saturday: 10 to 7

Buddy's Dive Shop
M.M. 80 Overseas Hwy.
Islamorada 33036
(305) 664-4704
Daily: 8 to 6

C & G Sporting Goods Inc.
137 Harrison Ave.
Panama City 32401
(904) 769-2317
Monday-Saturday: 8:30 to 5:30

Coastal Sport & Diving
2407 10th Ave. North
Lake Worth 33460
(305) 965-0524
Monday-Saturday: 10 to 7
Sunday: 7:30 to 2

D & S Diving
225 E. Brandon Blvd.
Brandon 33511
(813) 681-1961
Mon., Wed., Fri. & Sat.: 10 to 6
Tues. & Thurs.: 10 to 9

Dive Shop II
Sea Mist Marina
700 Casa Loma Hwy.
Boynton Beach, 33435
(305) 278-9111, 734-5566
Monday-Friday: 9 to 7
Saturday & Sunday: 8 to 5

The Diving Locker
295 Sunny Isle Blvd.
N. Miami Beach 33160
(305) 944-4531
Monday-Saturday: 9 to 9:30 p.m.
Sunday: 9 to 6

Franks Dive Shop
301 E. Blue Heron Blvd.
Riviera Beach 33404
(305) 848-7632
Monday-Friday: 8 to 5:30
Saturday & Sunday: 7 to 5:30

Ginnie Springs, Inc.
Route 1, Box 153
High Springs 32643
(904) 454-2202
1 (800) 874-8571
Daily: 8 to 6

Hal Watts Scuba Plus
2215 E. Colonial Dr.
Orlando 32803
(305) 896-4541
Monday-Friday: 1 to 6:30
Saturday: 9 to 6

Hall's Dive Shop
1688 Overseas Hwy.
Marathon 33050
(305) 743-5929
Daily: 9 to 6

Island Dive, Inc.
241 N. Collior Blvd.
Marco Island 33937
(813) 394-9777
Monday-Saturday: 9 to 6

Jensen Beach Divers
1991 Northeast Dixie Hwy.
Jensen Beach 33457
(305) 334-7333
Daily: 9 to 6

Key West Pro Dive Shop, Inc.
1605 N. Roosevelt Blvd.
Key West 33040
(305) 296-3823

Matheny's Aquatic Unltd., Inc.
11300 Beach Blvd.
Jacksonville 32216
(904) 642-3073
Tuesday-Saturday: 9 to 6

Ocean Pro Dive Shop Inc.
2259 Bee Ridge Rd.
Sarasota 33582
(813) 924-3483
Monday-Thursday: 10 to 6
Friday: 10 to 9
Saturday: 9 to 6

Pro Dive
2507 N. Ocean Blvd.
Pompano Beach 33062
(305) 942-3000
Daily: 8 to 8

Professional Diving Schools of Florida
Bahia Mar Yachting Center
Ft. Lauderdale 33316
(305) 761-3413
Daily: 9 to 5

Scuba Shop
230 N. Eglin Parkway
Fort Walton Beach 32548
(904) 863-1341
Sunday-Friday: 9 to 5
Saturday: 8 to 6

Scuba-Ski Inc.
118 9th St., South
Naples 33940
(813) 262-7389
Monday-Saturday: 10 to 6

Sea Center Dive Shop
M.M. 29½ Rt. U.S. 1
Big Pine Key 33043
(305) 872-2319
Daily: 8 to 6

Skipper's Diving Center
408 E. Wright St.
Pensacola 32501
(904) 434-0827
Summer/Daily: 9 to 6
Winter/Closed Sunday

Submariner
940 N.E. 20th Ave.
Fort Lauderdale 33304
(305) 522-7722
Monday-Friday: 10 to 6
Saturday: 9 to 5

Tackle Shack
7801 66th St. North
Pinellas Park 33565
(813) 546-5080
Monday-Saturday: 10 to 7

Vortex Springs
Route 2, Box 18A
Ponce de Leon 32455
(904) 836-4979
Monday-Thursday: 7:30 to 5
Friday-Sunday: 7 to 7

GEORGIA

Dive Sales & Salvage
1925 Piedmont Circle
Atlanta 30324
(404) 872-6448
Monday-Friday: 10 to 6
Saturday: 10 to 2

Garrard Pro Divers
2175 Old Concord Rd.
Smyrna 30080
(404) 432-5574
Monday-Thursday: 10 to 7:30
Friday & Saturday: 10 to 6

Diving Locker/Ski Chalet
42 W. Montgomery Cross Rds.
Savannah 31416
(912) 927-6603
Daily: 10 to 6

Diving Locker/Ski Chalet
1490 Baxter St.
Athens 30606
(404) 596-5877
Daily: 10 to 6

Planet Ocean Scuba Center
Windsor Village Shopping Center
Columbus 31909
(404) 563-8675
Monday-Friday: 10 to 6:30
Saturday: 10 to 5

HAWAII

Aloha Dive Shop
Koko Marina Shopping Center
Honolulu, Oahu 96825
(808) 395-8882, 5922
Daily: 8 to 5:30

Aquatics Kauai Ltd.
4-733 Kuhio Hwy.
Kapaa, Kauai 96746
(808) 822-9213
Monday-Saturday: 8:30 to 5:30
Sunday: 9 to 5

Central Pacific Divers
780 Front St.
Lahaina, Maui 96761
(808) 661-4661
Daily: 7 to 9

Fathom Five Prof. Divers
PO Box 907
Koloa, Kauai 96756
(808) 742-6991
Daily: 8:30 to 5:30

Hawaiian Divers
2344 Kamehameha Hwy.
Honolulu, Oahu 96819
(808) 845-6644
Monday-Friday: 9 to 5
Sat. & Sun.: 8 to 6

Kona Coast Skin Diver Ltd.
PO Box 1780, 75-5614 Palani Rd.
Kailua Kona 96740
(808) 329-8802
Daily including holidays: 7 to 6

Kona Reef Divers
PO Box 1409
Kamuela 96743
(808) 885-4841, 325-5555
Daily: 8 to 6

Lahaina Divers Inc.
710 Front St.
Lahaina, Maui 96761
(808) 667-7496
Daily: 8 to 9:30

Leeward Dive Center
85-979 Farrington Hwy.
Wainae, Oahu 96792
(808) 696-3414
Daily: 8 to 5

Maui Dive Shop
PO Box 1018 Azeka Pl.
Kihei, Maui 96753
(808) 879-3388
Monday-Friday: 8 to 9 p.m.
Sat. & Sun.: 8 to 6

Oahu School of Diving Pro Dive Shop
95 S. Kam Hwy.
Wahiawa, Oahu 96786
(808) 622-2283
Monday-Friday: 10 to 6
Sat. & Sun.: 8 to 4

Ocean Activities Center
3750 Wailea Alanui D2
Wailea, Maui 96753
(808) 879-4485
Daily: 9 to 6

Rainbow Divers
1652 Wilikina Dr.
Wahiawa, Oahu 96786
(808) 622-4532
Monday-Friday: 9 to 6
Sat. & Sun.: 8 to 6
Closed Wednesday

Scuba Schools of Maui
1000 Limahana Pl., Suite A
Lahaina, Maui 96761
(808) 661-8036
Daily: 8:30 to 5

Sea Paradise
PO Box 5655
Kailua-Kona 96740
(808) 322-2500
Daily: 7:30 to 5:30

Sea Sage
4-1378 Kuhio Hwy.
Kappa, Kauai 96746
(808) 822-3841
Daily including holidays: 8:30 to 5

Ocean Adventures
406 Kam Hwy.
Pearl City, Oahu 96782
(808) 487-9060
Monday-Sunday: 8 to 6
Sunday: 8 to 4
Closed Wednesday

South Seas Aquatics
1050 Ala Moana Blvd.
Honolulu 96734
(808) 538-3854
Monday-Friday: 10 to 9
Saturday: 10 to 5
Sunday: 10 to 4

Waikiki Diving, Inc.
420 Nahua St.
Honolulu, Oahu 96815
(808) 922-7188, 7189
Monday-Friday: 8 to 6
Sat. & Sun.: 8 to 5

IDAHO

The Scuba Diving Co.
219 W. 37th St.
Boise 83714
(208) 343-4470
Daily: 9:30 to 6:30

ILLINOIS

Anchor International Inc.
315 W. Ogden Ave.
Westmont 60559
(312) 971-1060
Monday-Friday: 12 to 9
Saturday: 10 to 5, Sunday: 10 to 3

Anchor International
1790 Algonquin Rd.
Arlington Heights 60005
(312) 253-1960
Monday, Tuesday, Thursday, Friday: 5 to 9

Aqua Center Inc.
43 E. Downer
Aurora 60506
(312) 896-3596
Monday-Friday: 7 to 9 p.m.
Saturday: 12 to 5
Closed Wed. & Sun.

Aquaventure Diving School
1655 Oakton St.
Des Plaines 60018
(312) 297-7414
Monday-Friday: 12 to 8
Saturday: 12 to 6
Closed Tues. & Sun.

Blue Hole Dive Shop
4817 W. Farmington Rd.
Peoria 61604
(309) 676-1852
Mon., Wed. & Fri.: 4 to 8
Saturday: 9 to 5
Sunday: (May 1-Sept. 15) 12 to 5

Underseas Scuba Center
626 N. Addison Rd.
Villa Park 60181
(312) 833-8383
Monday-Friday: 11 to 9
Saturday: 10 to 5

IOWA

Dubuque Yacht Basin
1630 E. 16th St.
Dubuque 52001
(319) 556-7708
Monday-Friday: 10 to 6
Saturday: 10 to 3

Iowa State Skin Diving Schools, Inc.
West University Plaza
7500 W. University Ave., Suite C
Des Moines 50311
(515) 255-0001
Monday-Friday: 10 to 7
Saturday: 10 to 6

INDIANA

Divers Supply Company, Inc.
3301 N. Illinois St.
Indianapolis 46208
(317) 923-5335
Mon., Wed., & Fri.: 9 to 7:30
Tues. & Thurs.: 9 to 5:30
Saturday: 9 to 5

Divers World
1271 E. Morgan Ave.
Evansville 47711
(812) 423-2738
Monday-Friday: 10 to 6
Saturday: 8 to 5

Midwest Scuba Center, Inc.
9508 Ross Lane
Indianapolis 46268
(317) 872-2522
Monday-Friday: 10 to 7
Saturday: 9 to 5

Pro Dive Shop
3203 Covington Road
Ft. Wayne 46804
(210) 432-7745

Underwater Adventures, Inc.
1509 Goshen Road
Fort Wayne 46808
(219) 484-1456
Monday-Friday: 11 to 7
Saturday: 9 to 5

KANSAS

The Dive Shop
3606 W. 95th St.
Leawood 66206
(913) 381-4400
Daily: 10 to 7

Sunflower Divers
10th and Holland
PO Box 74
Great Bend 67530
(316) 792-5420
Monday-Saturday: 2 to 7

KENTUCKY

Divers, Inc.
4807 Dixie Hwy.
Louisville 40216
(502) 448-7433
Monday-Friday: 10 to 7
Saturday: 10 to 5

Lexington Dive Shop
819 Euclid Ave.
Lexington 40502
(606) 266-4703
Monday-Friday: 11 to 7
Saturday: 11 to 5

Louisville Dive Shop
2478 Bardstown Rd.
Louisville 40205
(502) 458-8427
Monday-Friday: 11 to 7
Saturday: 11 to 5

LOUISIANA

Adventure Sports Inc.
1817 Texas Ave.
Shreveport 71103
(318) 425-5870
Monday-Saturday: 10:30 to 6:30

Aqua Sports
715 B. Trenton St.
W. Monroe 71291
(318) 323-4084
Monday-Friday: 10 to 5
Saturday: 10 to 3

Bayou Ventures Inc.
809 Brashear Ave.
Morgan City 70381
(504) 385-3483
Monday-Friday: 9 to 5
Saturday: 9 to 12

Oceans 1 School of Diving
1300 W. 21st Ave.
Covington 70433
(504) 892-9647
Monday-Saturday: 10 to 6

Sea Horse Diving Academy
5400 Crowder Blvd, Unit "E"
New Orleans 70127
(504) 246-6523
Monday-Friday: 11 to 7
Saturday: 10 to 6

Seven Seas
633 Oak Villa Blvd.
Baton Rouge 70815
(504) 926-1819
Monday-Saturday: 9:30 to 5:30

Seven Seas
3625 Perkins Rd.
Baton Rouge 70808
(504) 389-0026
Monday-Saturday: 9:30 to 5:30

Vineyards Dive Shop
1400 W. Esplanade Ave. Unit E
Kenner 70065
(504) 469-3483
Monday-Friday: 10 to 7
Saturday: 10 to 6

MAINE

Aqua Diving Academy
1183 Congress St.
Portland 04101
(207) 772-4200
Monday-Saturday: 10 to 5

Skin Diver's Paradise
RFD #3, Turner Rd., Box 817
Auburn 04210
(207) 782-7739
Monday-Friday: 2 to 9
Saturday: 7 to 6

MARYLAND

Divers Den Inc.
8105 Harford Rd.
Baltimore 21234
(301) 668-6866
Mon., Tues., Thurs., & Fri.: 9:30 to 9
Wed. & Sat.: 9:30 to 5

Divers World
923 Gist Ave.
Silver Springs 20910
(301) 587-7794
Monday-Friday: 10 to 9
Saturday & Sunday: 9 to 5

The Scuba Hut Inc.
7649 Crain Hwy., S.W.
Glen Burnie 21061
(301) 761-4520
Mon., Wed. & Fri.: 10 to 8
Tuesday & Saturday: 10 to 6

Tide Water Aquatics
1315 Forest Dr.
Anapolis 21403
(301) 268-1992
Monday-Friday: 10:30 to 7:30
Saturday: 10:30 to 5:30

MASSACHUSETTS

Lowell Scuba Center
477 Gorham St.
Lowell 01852
(617) 453-7574
Monday-Friday: 11 to 7
Saturday: 11 to 5:30

So. Shore Skindivers, Inc.
511 Washington St.
Quincy 02169
(617) 471-9800, 773-5452
Monday-Saturday: 9:30 to 8:30
Sunday: 9 to 1

United Divers, Inc.
59 Washington St.
Somerville 02143
(617) 666-0410
Monday-Friday: 10 to 8, Saturday: 9 to 6,
Summer/Sunday: 9 to 4

Whaling City Diving Center
39 Main St.
Fairhaven 02719
(617) 992-2662
(Winter) Monday-Friday: 4:30 to 7:30
Sat.: 10 to 4, Sun.: 9 to 12
(Summer) Monday-Friday: 10 to 7:30
Sat.: 9 to 5, Sun.: 9 to 1

MICHIGAN

Divers Supply Company
2377 N. Long Lake Rd.
Fenton 48430
(313) 629-3483
Mon., Tues., Thurs. & Fri.: 10 to 8
Wed. & Sat.: 10 to 6

Kalamazoo Dive Center
1622 Bloomfield Ave.
Kalamazoo 49001
(616) 345-2060
Monday-Friday: 10 to 7
Saturday: 10 to 5

Recreational Systems, Inc.
3380 Washtenaw Ave.
Ann Arbor 48104
(313) 971-7771
Monday-Friday: 10 to 6
Saturday: 10 to 5
Closed Tues. & Sun.

Recreational Diving Systems
4424 N. Woodward
Royal Oak 48072
(313) 549-0303
Monday-Friday: 10 to 7
Saturday: 10 to 5

Scuba North, Inc.
13258 W. Bayshore Dr.
Traverse City 49684
(616) 947-2520
Monday-Thursday: 9 to 6
Friday & Saturday: 9 to 7
Sunday: 10 to 5
(Winter) Mon-Sat.: 10 to 6

The Scuba Shack
9982 W. Higgins Lake Dr.
Higgins Lake 48627
(517) 821-6477
(Summer) Monday-Friday: 9 to 5
Saturday & Sunday: 8 to 8

Seaquatics, Inc.
979 S. Saginaw Road
Midland 48640
(517) 835-6391
Monday-Friday: 10 to 6
Saturday: 10 to 5

Skamt Shop
5055 Plainfield N.E.
Grand Rapids 49505
(616) 364-8418
Monday, Wednesday, Friday: 10 to 9
Tuesday, Thursday, Saturday: 10 to 6

Tom & Jerry's Skin & Scuba Shop
20318 Van Born Ave.
Dearborn Heights 49125
(313) 278-1124
Monday-Friday: 11 to 7
Saturday: 11 to 5

Tom & Jerry's Scuba & Sport Shop
8655 Dixie
Fairhaven 48023
(313) 725-1991
Daily: 10 to 5

ZZ Under Water World, Inc.
1806 E. Michigan Avenue
Lansing 48912
(517) 485-3894
Monday-Friday: 10 to 7
Saturday: 10 to 5

MINNESOTA

Central Minnesota Divers Corp.
102 E. St. Germain
St. Cloud 56301
(612) 252-7572
Monday-Friday: 10 to 7
Saturday: 9 to 5

Club Scuba East
2280 Maplewood Dr.
Maplewood 55109
(612) 484-7252
Monday-Friday: 10 to 8
Saturday: 10 to 5
(Summer) Sunday: 9 to 1

Club Scuba West
1300 E. Wayzata Blvd.
Wayzata 55391
(612) 473-4266
Monday-Friday: 10 to 8
Saturday: 10 to 5
(Summer) Sunday: 9 to 1

MISSISSIPPI

Earl's Dive Shop
0812 Pass Rd.
Gulfport 39501
(601) 863-2075

Skippers Diving
4441 N. State
Jackson 39201
(601) 362-6969
Monday-Friday: 10 to 6
Saturday: 10 to 5

MISSOURI

Divers Village
PO Box 329, Lake Road West 20
Lake Ozark 65049
(314) 365-3242
Daily: 9 to 6

John The Diver
S.R. 1, Box 911
Branson 65616
(417) 338-2224
Daily: 8 to 8
Nov. through Feb. open by appt.

Table Rock State Park Marina
S.R. 1, Box 911
Branson 65616
(417) 334-3069
Daily: sunrise to sunset
Nov. through Feb. open by appt.

The Dive Shop
8135 North Oak
Kansas City
(816) 436-5448
Monday-Friday: 10 to 7
Saturday: 10 to 5

MONTANA

Mountain State Divers Supply
1525 Central
Billings 59102
(406) 252-7583
Monday-Saturday: 9 to 6

NEBRASKA

Action Sports Omaha
Baker Square
13463 W. Center Rd.
Omaha 68144
(402) 334-8420
Mon., Tues., Wed., Fri.: 10 to 7
Sat.: 10 to 5

Fathom Dive
13 W. 18th
Scotts Bluff 69361
(308) 635-1556
Daily: 10 to 6

NEVADA

Scuba Center
1050 South Main
Las Vegas 89101
(702) 386-0542
Monday-Saturday: 9 to 7

Sierra Dive Co.
104 E. Grove St.
Reno 89502
(702) 825-2147
Mon., Tues., Thurs. & Fri.: 9 to 6
Wednesday: 9 to 9:30
Saturday: 10 to 5

NEW HAMPSHIRE

Atlantic Aqua Sports
522 Sagamore Rd.
Rye 03870
(603) 436-4443
Daily: 8 to 5, Closed Tues.

NEW JERSEY

Cedar Grove Divers Supply
492 Pompton Ave., Route 23
Cedar Grove 07009
(201) 857-1748
Tuesday-Friday: 12 to 9
Saturday: 10 to 5
Closed Sunday & Monday

Professional Divers, Inc.
70 Hwy. 35
Neptune City 07753
(201) 775-8292
Monday-Friday: 11 to 8
Saturday: 10 to 6
Sunday (Summer): 9 to 1

The Edison S/D Center
1659 Hwy. 27
Edison 08817
(201) 985-2206
Monday-Friday: 5 to 9:30
Saturday: 10 to 8

Underwater Sports Inc.
Route 17 South
Rochelle Park 07662
(201) 843-3340
Monday: 10 to 7
Tues. -Fri.: 10 to 9
Sat.: 10 to 6

NEW MEXICO

New Mexico School of Diving
207 E. Main St.
Farmington 87401
(505) 325-2728
Monday-Saturday: 10 to 6

New Mexico Scuba Schools, inc.
11200 Montgomery NE
Albuquerque 87111
(505) 292-7990
Monday-Saturday: 10 to 7

NEW YORK

Atlantis 2
498 Avenue of the Americas
New York 10011
(212) 924-7556
Mon., Thurs., Fri., & Sat.: 10 to 7
Tuesday & Wednesday: 12 to 7

Cougar Sports
590 Central Park Ave.
Scarsdale 10583
(914) 723-2266
Monday-Wednesday: 10 to 6
Thursday: 10 to 7, Friday: 10 to 8
Saturday: 10 to 5

Danziger Sporting Goods
70 Freeport Mall
Freeport 11520
(516) 378-4480
Monday-Saturday: 10 to 5:30

King County Divers Corp.
2417 Avenue U
Brooklyn 11229
(212) 648-4232
Monday-Friday: 2 to 9
Saturday: 10 to 9

Niagara Scuba Sports
2048 Niagara St.
Buffalo 14207
(716) 875-6529
Mon., Tues., Thurs., & Fri.: 9 to 8:30
Wed. & Sat.: 9 to 5:30
Sunday (June through September):
9 to 11:30

National Aquatic Service, Inc.
1732 Erie Blvd. East
Syracuse 13210
(315) 479-5544
Monday-Friday: 9 to 5
Saturday: 9 to 4

Suffolk Diving Center
58 Larksfield Rd.
E. Northport 11731
(516) 261-4388
Monday-Thursday: 10 to 6
Fri.: 10 to 8, Sat.: 10 to 6
Sunday: 10 to 3

NORTH CAROLINA

Blue Dolphin Dive Shop
1006 National Hwy.
Thomasville 27360
(919) 475-2516
Monday-Thursday: 10 to 7
Friday: 10 to 9
Saturday: 8 to 6

Rum Runner Dive Shop Inc.
2717 E. 10th St. PO Box 3157
Greenville 27834
(919) 758-1444
Monday-Friday: 10 to 5

Sport Divers Inc.
2600 South Blvd.
Charlotte 28209
(704) 525-9234
Monday-Saturday: 9 to 6:30

Underwater Unlimited, inc.
2438 Park Road
Charlotte 28203
(704) 372-9130
Monday-Saturday: 10 to 6:30

OHIO

Buckeye Diving School
46 Warrensville Center Rd.
Bedford 44146
(216) 439-3677
Mon., Wed., & Fri.: 12 to 8
Tues. & Thurs.: 11 to 6
Saturday: 10 to 5:30

C & J Scuba
5825 North Dixie Dr.
Dayton 45414
(513) 890-6900
Monday-Thursday: 10 to 7
Friday: 10 to 9
Saturday: 10 to 5

Dale's Diving Shop Inc.
302 Meigs St.
Sandusky 44870
(419) 625-4134
10:30 to 5:30
Closed Wednesday and Sunday

Dive Inc.
428 Park Ave. West
Mansfield 44906
(419) 524-2484
Monday-Friday: 11 to 7
Saturday: 10 to 4

Divers Paradise
2511 N. Reynolds Rd.
Toledo 43615
(419) 535-6828
Monday-Friday: 11 to 7
Saturday: 10 to 5

Jaqua's Sporting Goods
315 S. Main St.
Findlay 45840
(419) 422-2244
Monday: 8:30 to 9
Tuesday-Saturday: 8:30 to 5:30

Ka-Puka-Wai Dive Shop
1506 Whipple Ave. N.W.
Canton 44708
(216) 478-2511
Monday & Thursday: 11 to 9
Tues., Wed., & Fri.: 11 to 6
Saturday: 10 to 5

Sub-Aquatics Inc.
8855 E. Broad Street
Reynoldsburg 43068
(614) 864-1235
Monday, Tuesday: 10 to 5
Wednesday-Saturday: 10 to 7

OKLAHOMA

Chalet Sports
2822 Country Club Dr. West
Oklahoma City 73116
(405) 840-1616
Monday-Saturday: 10 to 6

Oklahoma School of Scuba
1015 1st N.W.
Ardmore 73401
(405) 223-1032
Friday-Wednesday: 10 to 5

OREGON

Adventure Scuba
570 Old Hwy. 62
Eagle Point 97524
(503) 826-5317
1 to 6 or by appt.

Aquarius Too
510 Market St.
Klamath Falls 97601
(503) 884-3330
Monday-Friday: 8 to 5:30

Beaver Water Sports, Ltd.
924 N.W. Circle Blvd.
Corvallis 97330
(503) 758-4202
Monday-Friday: 9 to 6
Saturday: 9 to 5

Deep Sea John's
PO Box 1557
Newport 97365
(503) 867-3742
Daily: 7 to 6

Northwest Divers Supply
852 S. Broadway
Coos Bay 97402
(503) 267-3723
Monday-Saturday: 9 to 6
Sunday: 9 to 1

Streed's Scuba Unlimited, Inc.
8450 S.E. 82nd Ave.
Portland 97288
(503) 777-3347
Monday-Thursday: 10 to 7
Friday: 10 to 9
Saturday: 10 to 6

Tri-West Diving School
13604 S.E. Powell
Portland 97236
(503) 761-5435
Monday-Friday: 10 to 8
Saturday: 10 to 5

PENNSYLVANIA

B & B Marine Specialties
Hillsville-Bessemer Rd.
Hillsville 16132
(412) 667-9448
Daily: 9 to 7

D.J. Hydro Sports
2316 Peach St.
Erie 16502
(814) 455-5861
Monday-Friday: 9 to 6:30
Saturday: 9 to 4:30

Smokey's Divers Den
412 N. Duke St.
Lancaster 17602
(717) 393-5333
Monday-Friday: 9 to 9
Saturday: 9 to 5

RHODE ISLAND

Viking Dive Shop
124 E. Main Road
Middletown 02840
(401) 847-4179
Sun. -Friday: 10 to 6
Sat.: 10 to 5:30

SOUTH CAROLINA

Neptune Dive & Ski, Inc.
133 Georgia Ave.
North Augusta 29841
(803) 279-2797
Monday-Saturday: 10:30 to 6

Wateree Diving School & Equipment
1310 Bush River Mall
Columbia 29210
(803) 731-9344
Monday-Friday: 10:30 to 6:30
Saturday: 10 to 6

SOUTH DAKOTA

Donovans Hobby & Scuba Center
1908 W. 42nd St.
Sioux Falls 57105
(605) 338-6945
Mon., Wed., Fri.: 9 to 9
Tuesday & Thursday: 9 to 6
Saturday; 9 to 4:30

TENNESSEE

Diving Adventures
3046 Nolensville Rd.
Nashville 37211
(615) 333-DIVE(3483)
Monday-Saturday: 9 to 6

Ski-Scuba Center Inc.
3521 Sutherland Ave.
Knoxville ZIP CODE
(615) 523-9711
Monday-Saturday: 10 to 6

TEXAS

Aqua Sphere
112 Tremont
Galveston
(409) 765-7001
Monday-Saturday: 9 to 6

The Aquanaut
1009 University Ave.
Lubbock 79401
(806) 744-6056
Tuesday-Saturday: 11 to 5

Aquaventures Dive Shop
1447½ Grand Ave. & I.H. #10
Beaumont 77701
(409) 832-0254
Monday-Saturday: 9 to 6

Blue Water Diving School
910 Westheimer
Houston 77006
(713) 528-0634
Call for appt.

Copeland's
4041 S. Padre Island Dr.
Corpus Christi 78411
(512) 854-1135
Monday-Friday: 10 to 7
Saturday: 9 to 5

Del Rio Diving
PO Box 420564
Hwy. 90 West
Diablo East Marina
Del Rio
(512) 775-2949
Tuesday-Sunday: 7 to 5

Diver's Depot-I
720 South St.
Nacogdoches 75961
(409) 564-9622
Monday-Saturday: 10 to 6

Divers Supply Co.
325 S. Vine Ave.
Tyler 75702
(214) 593-2777
Monday-Friday: 10 to 5:30
Saturday: 9 to 2
Closed for lunch: 12 to 1

Gulf Safari Inc.
716 N. Hwy. 288
Clute 77531
(409) 265-8401
Monday-Saturday: 9 to 6

Lake LBJ Marineland (Scuba Unlimited)
Hwy. 1431 East, PO Box 52
Kingsland 78639
(915) 388-4724, 6034
Monday-Saturday: 8:30 to 5

School of Scuba
942 Walnut
Abaleen 79601
(915) 673-2949
Monday-Saturday: 10 to 6:30

Scuba Diving School of Fort Worth
3807 Southwest Blvd.
Fort Worth 76116
(817) 732-5761
Monday-Saturday: 10 to 6

Scuba West
5500 Greenville, Suite 901
Dallas 75206
(214) 750-6900
Monday-Saturday: 10 to 6

Scuba West
586 Lincoln Square
Arlington 76010
(817) 277-1122
Monday-Saturday: 10 to 6

Scuba West
14902 Preston Rd., Suite 412
Dallas 75240
(214) 960-1300
Monday-Saturday: 10 to 6

Scuba West
12801 Midway Rd., Suite 401
Dallas 75234
(214) 241-2900
Monday-Saturday: 10 to 6

Trident Diving Equipment
2110 West Ave.
San Antonio 78201
(512) 734-7442
Monday-Saturday: 10 to 7

UTAH

Scuba Utah
2356 S. Redwood Rd.
Salt Lake City 84119
(801) 972-3205
Monday-Friday: 10 to 6
Saturday: 10 to 4

Scuba Utah North
860 Riverdale Rd. A-2
Ogden 84403
(801) 394-8842
Monday-Friday: 10 to 6
Saturday: 10 to 4

VERMONT

Chiott Marine
67 Main St.
Burlington 05401
(802) 862-8383
Daily: 9:30 to 6

VIRGINIA

Lynnhaven Dive Center
1413 Great Neck Rd.
Virginia Beach 23454
(804) 481-7949
Monday-Friday: 9 to 8
Saturday: 9 to 6
Sunday: 9 to 4

Universal Divers Supply
1822 Featherstone Rd.
Woodbridge 22191
(703) 491-1194
Tuesday-Saturday: 10 to 6

WASHINGTON

Bellingham Dive & Travel
2720 W. Maplewood
Bellingham 98225
(206) 734-1770
Call for store hours and appts.

Capital Skin & Scuba
107 E. State St.
Olympia 98501
(206) 357-4128
Monday-Saturday: 9:30 to 6

Chelan Divers
South Lakeshore Dr.
Chelan 98816
(509) 682-4466
Daily: 9 to 5

The Dive Inn
3215 River Rd.
Yakima 98902
(509) 453-2836
Monday-Saturday: 10 to 6

Mike's Diving Center
Route 5, Box 916
Shelton 98584
(206) 877-9568
Monday-Friday: 10 to 6
Saturday: 8 to 7
Sunday: 9 to 6
Closed Wednesday

Northwest Divers Inc.
4815 N. Pearl
Tacoma 98407
(206) 752-3973
Monday-Saturday: 10 to 6

Northwest Divers Inc.
1113 River Rd.
Puyallup 98371
(206) 845-5350
Monday-Saturday: 10 to 6

Scuba Center of Spokane
N. 3607 Division St.
Spokane 99207
(509) 326-4653
Monday-Saturday: 10 to 6

Silent World Divers
13600 N.E. 20th, Bldg. F., Suite A
Bellevue 98005
(206) 747-8842
Monday-Friday: 10 to 7
Saturday: 9 to 6

Sound Dive Center
990 Sylvan Way
Bremerton 98310
(206) 373-6141
Monday-Friday: 10 to 6
Saturday: 9 to 6
Sunday (April to Sept.): 11:30 to 3

Syphers Diving Supply
1913 Pleasant St.
Walla Walla 99362
(509) 529-1964
Monday-Friday: 4 to 9 (and by appt.)

Underwater Sports
10545 Aurora Ave., North
Seattle 98133
(206) 362-3310
Monday-Saturday: 9 to 9
Sunday: 9 to 6

Whidbey Divers Supply
80th N.W. & 900 West
Oak Harbor 98277
(206) 675-1112
Monday-Friday: 10 to 6
Saturday & Sunday: 9 to 5

WISCONSIN

Bennett Academy of Ski & Scuba
6509 W. North Ave.
Wauwatosa 53213
(414) 258-6440
Mon., Tues. & Sat.: 10 to 6
Wed., Thurs., & Fri.: 10 to 9

Central Wisconsin Diving Academy
1331 8th St. South
Wisconsin Rapids 54494
(715) 424-3052
Monday-Thursday: 9 to 5
Friday: 9 to 9
Saturday: 9 to 5

On The Rocks Scuba Shop Dive Resort
849 Wisconsin Bay Road
Ellison Bay 54210
(414) 854-2808
June-Oct.: 9 to 6

WYOMING

Wyoming Scuba Sports
1604 D East Lincoln Way
Cheyenne 82001
(307) 632-7878
Mon.-Sat.: 10 to 7
Sun: 10 to noon

CARIBBEAN

Aquatic Centres
Box 108, Road Town
Tortola, B.V.I.
1 (800) 345-6296 or
Pa. residents 1 (800) 362-5255
Monday-Saturday: 9 to 12, 1:30 to 5:30

Baskin in the Sun
PO Box 851
Port-au-Prince, Haiti
2-5773
Daily: 9 to 5

Buceo Dominicana
960 Abraham Lincoln Ave.
Santo Domingo, Dominican Republic
(809) 567-0346, 6116
Monday-Friday: 8 to 12:30, 3 to 7
Saturday: 8 to 4
Sunday: 8 to 12

Dive Bonaire
Flamingo Beach Hotel
Bonaire, Netherland Antilles
(011) 5997 8285
Daily: 8:30 to 6

Dive BVI Ltd.
Virgin Gorda Yacht Harbour
Box 1040, Virgin Gorda, B.V.I.
(809) 495-5513 (Day)
(809) 495-5519 (Night)
Monday-Saturday: 8:30 to 12, 1 to 5

The Dive Shop, Ltd.
PO Box 44B, St. Michael
Barbados, W.I.
(809) 426-9947, 2031
Daily: 9 to 5

"La Cueva Submarina"
PO Box 151
Isabela, Puerto Rico 00662
(809) 872-3903
Daily: 8:30 to 5:30

Tamarlain Watersports
PO Box 247, The Valley
Anguilla, B.W.I.
(809) 497-2798, 2462
Daily: 9 to 5

UNEXSO-Underwater Explorers Society
PO Box F2433
Freeport, Bahamas
(809) 373-1244
Daily: 8 to 5

Virgin Islands Diving Schools, Inc.
PO Box 9707, Charlotte Amalie
St. Thomas, V.I. 00801-3400
(809) 774-8687, 7368
Monday-Saturday: 8 to 5

CANADA

Afonso Diving Supply Ltd.
50 Quidi Vidi Village Rd.
St. John's, Newfoundland
(709) 753-6070
Monday-Saturday: 9 to 5

Bo-Lan
85 Laviguer St.
Quebec City, Quebec G1R 1A8
1 (418) 525-8893
Monday-Friday: 9 to 5:30

Dive Rescue-Sub Sea Experience
6928 104th St.
Edmonton, Alberta T6H 2L7
(403) 434-1433
Monday-Saturday: 9 to 5:30

The Divers Log/ Nautilus School of Diving
6164 Quinpool Rd.
Halifax, Nova Scotia
(902) 454-4296 or 453-2640 Pager 202
Monday-Wednesday: 10 to 6
Thursday, Friday: 10 to 8
Saturday: 10 to 6

Ocean Centre
468 Burnside Road East
Victoria, B.C. V8I 2X2
(604) 386-7528
Monday-Saturday: 9 to 6
Sunday: 9 to 1

Rimpac Divers Ltd.
9818 Fifth St.
Sydney, B.C. V8L 2X3
(604) 656-6313
Daily: 9 to 5:30

Seafun Divers Ltd.
1761 Island Hwy.
Campbell River, B.C. V9W 2A8
(604) 287-3622
Monday-Saturday: 9 to 5:30

Seafun Divers Ltd.
300 Terminal Ave.
Nanaimo, B.C.
(604) 754-4813
Monday-Saturday: 9 to 6

Skin & Scuba Schools
#7, 3601-19th St. N.E.
Calgary, Alberta T2E 6S8
(403) 230-2365
Tuesday-Saturday: 10 to 6

FOREIGN

CENTRAL AMERICA

Doc's Dive Shop
Cocoview Resort
French Harbor
Roatan, Honduras
1 (800) 282-8932, (813) 973-0651
Mon.-Sun.: 8 to 6

St. George's Lodge
Box 625
Belize City, Belize C.A.
011-501-44190
Daily: 24 hours

CYPRUS

Ninos V. Michaelides Ltd. (Ninos Sports)
PO Box 262
Limassol, Cyprus
(051) 72667
Daily (Summer): 8 to 1, 4 to 7
(Winter): 8 to 1, 2 to 6

MEXICO

Aqua Safari
Av. Rafael Melgar 401
Cozumel, Q. Roo
01152987-20101 or -20661
Mon.-Sat.: 8 to 1, 4 to 6:30

Mulege Divers
Madero #45
Mulege, Baja Ca. Sur
Monday-Saturday: 10 to 1, 4 to 7

MICRONESIA

Microesia Aquatics
PO Box 57
Truk Lagoon, FSM 96942
Daily: 8 to 5

Palau Dive Center
PO Box 5
Koror, Repulbic of Palay 96940
Cable: Itarukoror
Daily: 9 to 6

Water Sports, Inc.
PO Box 31 CHRB
Garapan, Saipan CNMI 96950
6664
Daily: 7 to 9 p.m.

SAUDI ARABIA

Desert Divers
Al Rawdah Shopping Centre
Prince Abdullah St.
PO Box 160
Jeddah—21411, Saudi Arabia
(02) 660-8537

SOUTH AMERICA

Aqua Center Limitada
Enrique Meiggs #1960
Quintero, Chile
269
Call for appt.

Boz S.A.
Carlos Villaran 1004
Lima, Peru
718982
Call for appt.

Octopus
(Instruction, Sales/Service, Trips)
Calle 5 No. 66-42
Calle Valle, Colombia
57 (93) 398024
9 to noon, 3 to 7

SOUTH PACIFIC

Island Dive Services Ltd.
PO Box 414
Honiara, Solomon Islands
22103 or Telex HO 66315
Daily: 8 to 5

Nautilus Dive Shop
B.P. 78
Port Vila, Vanuatu, So. Pacific
2398
Daily: 7:30 to 11:30, 2 to 5:30

Scubahire Ltd.
GPO Box 777
Suva, Fiji Islands
361-088
Daily: 8 to 5

Operation Giulia...

In Search of a Roman ship.

Italian divers discover the wreck

"It's an enormously important discovery," reported the Italian Revenue Office after the discovery of the relics of a Roman ship in the Sea of Ventotene. People were swept away by enthusiasm, and rightly so, as the reports of the Rome Superintendent of Fine Arts confirmed. In just over a month of excavation, so many relics were discovered it made this a historical event, the most important ever made in the Mediterranean.

The story of this discovery started at the beginning of August, 1983, when a revenue patrol boat found some Roman amphorae aboard a German tourist's yacht. According to the Germans, the pieces were found 42 meters deep in a sandy area around the center of a channel between Ventotene and Santo Stefano — a difficult area to dive due to the strong undersea currents and the considerable depth.

Despite these difficulties, a search was commenced for scientific reasons and because there is always the hope of finding something really important.

Archaeology is in part a romantic science. The great myths and legends have always played a part in it. And in this case, a legend which had been passed down at Ventotene from generation to generation for centuries generated considerable interest in this project.

Ventotene is one of the Pontine Islands. It lies approximately 25 miles from the Lazio coast. In the first century A.D., Giulia, daughter of emperor Augustus, lived on the island confined there by her father for her immoral behavior. The villa where Giulia stayed is now reduced to a mass of rubble.

Ventotene later became a trade center visited by many merchant ships, which anchored in its splended port. Legend has it that a Roman ship with a golden prow was plundered by pirates infesting the Pontine Islands. Fire destroyed the ship and her relics sunk into the sea in front of the island.

It was therefore understandable that the Revenue Patrol of Civitavecchia was interested in this find. Under the command of Colonel Soggiu, Captain Paoletti and the Head Diver, Chief Petty Officer Giovanni started the so called "Giulia Operation."

The problem of immersion shifts which were extremely tricky due to the depth and the difficult conditions in which it was necessary to work were carefully studied. Professor Pelaia, of the Hyperbaric Centre of the Policlinico Umberto I in Rome was brought in as a safety adviser.

Safety and immediate rescue were assured by Lieutenant Blasi of the Aircraft Section of the Sea Practice Revenue, who placed two helicopters at the divers disposal.

The beginning of the excavation did not produce great results. For a week, excavation proceeded with the aid of a dredge and the first layer of sand was removed fairly easily. A second, more compact layer of sand was hit and the work became more difficult. A coast guard ship and hydrojet were anchored above the excavation zone. Divers had discovered a cement mooring in the area indicating that without the intervention of the government, the Giulia Operation would have been carried out secretly, by someone already preparing for a systematic recovery

The divers proceeded slowly. During the night, the strong currents in that part of the sea caused sand slides at the edges of the excavations, partially destroying the work the divers had performed during the day.

Every morning the sand deposited during the night had to be removed, before restarting excavation. This led to the conclusion that work was being carried out on a layer still intact, impossible to reach without suitable equipment.

In the second week of excavating, ship chandeliers, iron and wooden nails, amphorae and small earthenware containers were discovered. These were the first important relics of the ship's structure and increased everyone's conviction that work was proceeding in the right direction.

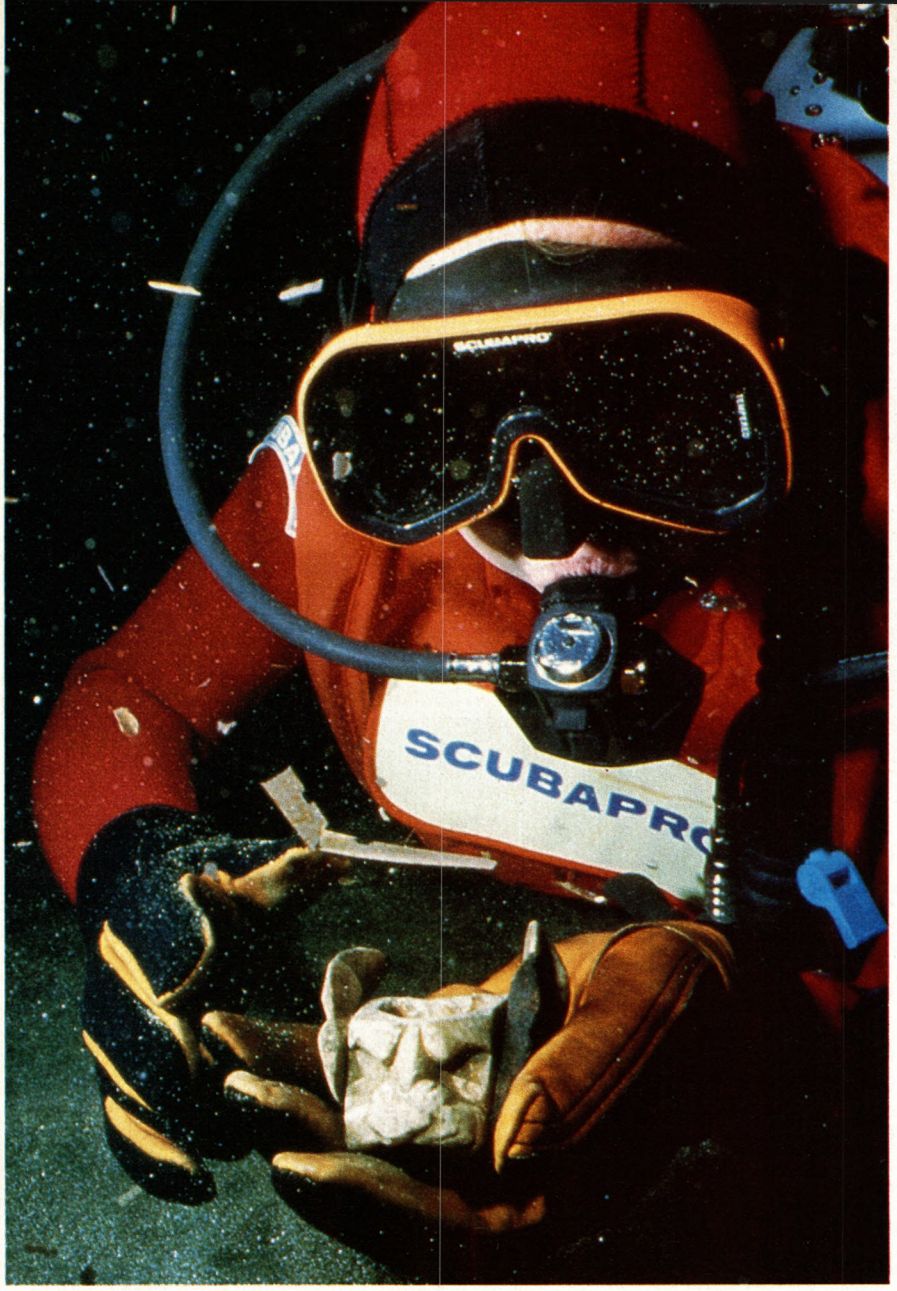
A few days later, the ship's frames were discovered still intact. Within the ship's framework, a head measuring approximately five centimeters was also found. It was finely worked in valuable material, presumably ivory, portraying a woman's face. Certainly a precious object, like all the relics discovered, it was the result of long hours of difficult labor for the divers.

Other heads, some busts and the head of a fawn of rare beauty were also uncovered. The fawn was one of the most important finds. It has long ears and a face contracted in a strange expression.

At this stage, practically every dive was producing important relics. Roman styli in ivory and copper of different shapes were discovered in the sand. Some of them were immediately identified as instruments for writing on wax panels, but it was impossible to interpret the use of others.

Many of the relics, particularly those made of wood, were recovered in practically perfect condition from the sand, where they had remained for 2,000 years. After a month's work, the divers had uncovered a large part of the hull structure, revealing clear signs of burning on the ends of some frames. This led researchers to conclude the ship was probably destroyed by fire.

At this point, the wreck was definitely identified as a cargo ship, presumably heading for villa Giulia with valuable objects on board, among them, it may be deduced from the remains found, a triclinium (dining couch) decorated with ivory statuettes, crockery with bone decorations, gold coins, marble statuettes, of which only the pedestals were found, and small bowls probably designed to contain perfume or ointment.



This was certainly a rich vessel.

The material discovered and condition of the wreck confirms the hypothesis that it was, in fact, the pirates of the Pontine Islands who sank the ship after partially plundering it.

The most important find of the entire recovery was discovered on one of the final dives. This was a pair of wooden sandals, the first ever found which dated to such a early period. The sandals

Above are small heads from the Roman wreck. At left, a diver holds a long-eared, ivory idol.

seemed to belong to a woman or a child.

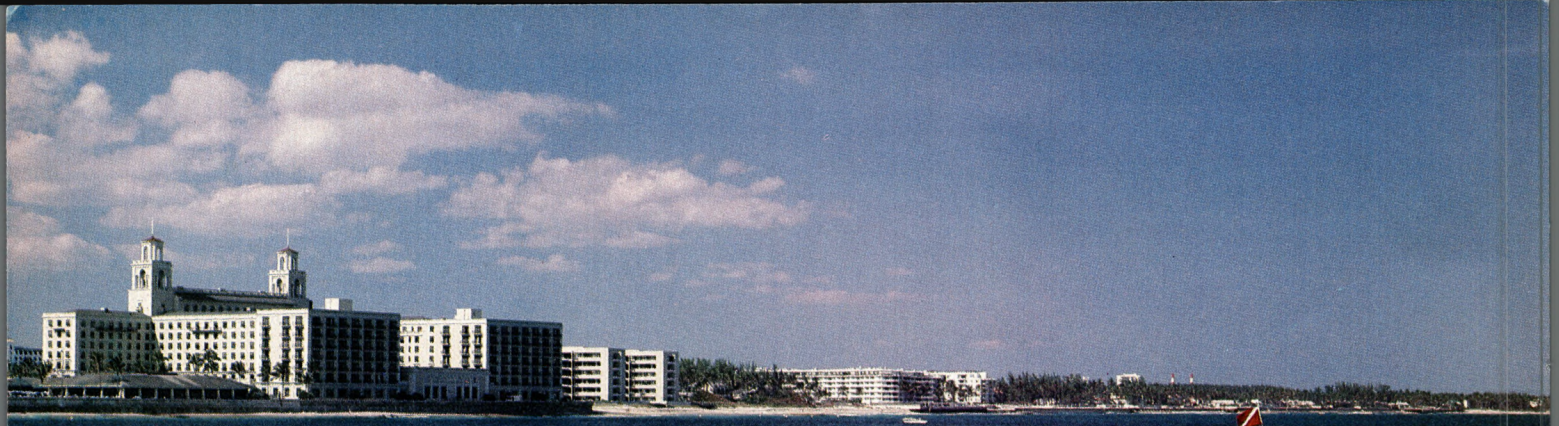
It was the discovery of these sandals, one of which the sea returned in miraculously intact condition, that made this already extremely important archaeological operation, a world event. All the material found was sent for classification to Dottoressa Veroccia of the Superintendence of Fine Arts. Restoration will be done by the Florence team which worked on the Bronzes of Riace.

No trace was found of the mythical gold prow of the legendary ship. But we know that legends are only legends. Reality is, unfortunately, another matter. **S**

of the Golden Prow

BY ENNIO De SANTIS

At left, is the Roman port on Ventolene Island. Below are the sandals, considered the most important discovery of the operation.



The Other Side of Florida

BY M. TIMOTHY O'KEEFE

The Florida Keys may long continue to be one of the most-dived spots in the entire world, but there's another side to Florida and one day it could be a rival in popularity. It's the famed Gold Coast, a strip of Atlantic beachfront stretching from the Palm Beaches to Fort Lauderdale boasting mile after mile of ultra-posh, million-dollar real estate.

For decades vacationers have been lured to these golden sands by the numerous luxury hotels and almost year-round warm weather. Until the opening of Disney and all the other "Worlds" in Orlando in the 1970s, the Gold Coast was the state's numer one vacation destination — no secret to college students who migrated here in such phenomenal numbers every spring that Hollywood glorified the spectacle with a raft of "B" movies.

Vacationers were so preoccupied with what was happening on land, almost no one paid attention to what was straight off the beach — amazingly abundant coral gardens, a wide array of wrecks and bountiful supplies of fish and lobster.

In the 1970s, particularly around the Palm Beaches, things began changing. As more people explored the area, Floridians discovered they had a kind of mini-Keys situation in their own backyard, which because of its more northerly location, was much more convenient. The Keys were undeniably terrific, but the

M. Timothy O'Keefe is Editor At Large for *Florida Sportsman* and a frequent contributor to major outdoor publications. His photo credits include *Time-Life* books and *National Geographic*.

long tedious drive was simply too far for short one and two-day bounce dives.

Furthermore, the conditions at Palm Beach were ideal for student divers anxious for their first taste of salt water. If a student could do well on a check-out dive here, he or she should have no trouble diving anywhere in the Keys or the Caribbean.

As word of the new gold strike spread among Floridians, dive operations began to proliferate and prosper. Today, the Gold Coast is Florida's No. 2 dive location. And it's more than just the locals who have caused the shift. Divers from as far away as Orlando and Tampa think nothing of getting up early on a Sunday morning, driving three to four hours to Palm Beach, getting in two tanks before returning home. Georgia divers on long weekends also began short-stopping at Palm Beach instead of trekking to the Keys which added as much as eight hours to their round-trip travel time.

Despite growing popularity, Palm Beach dive sites are still never as crowded as the Pennekamp area. Most out-of-state divers still aren't aware of this new Florida alternative. Because of the area encompassed, the sites tend to be so spread out and of such variety, divers don't find themselves crowded elbow to flipper like spiny lobsters on a migration march. Another bonus is that most of the sites are only 20 minutes or so from shore.

Equal to the underwater attractions is the huge land-based entertainment complex which has long attracted people to the Gold Coast in the first place. After exhausting two tanks, there is much more to do than simply sit around a beach-hut bar and wait for the next day's diving. Horse racing, dog racing, jai-alai, night clubbing, excellent restaurants, resort hotels and deep sea fishing in the Gulf Stream are just a few of the handy diversions. Probably no other diving destination offers the tremendous variety to be found here. And that's important to a lot of people who want their dive trip to also be a true, all-round vacation.

Although the oceanfront is one of the most-developed anywhere, the marine life is extremely profuse, and includes plenty of deep water inhabitants not normally encountered so close to shore. The reason is the Gulf Stream, the warm water current that is home for such creatures as ocean sunfish, loggerhead turtles, sharks, big rays and other pelagic species.

Excellent diving lies just offshore of Florida's vacation mecca - West Palm Beach.

But the Gulf Stream — which some divers refer to as the underwater version of the jet stream — also creates a substantial current through the deeper sites. Instead of battling this 3- to 4-knot force, experienced divers have given up fighting it and joined it instead. They use a style of diving that enables them to drift with the current, to go with the flow rather than against it. In this way considerable territory can be covered without becoming exhausted.

Drift diving, coral reefs and wrecks — the Gold Coast has them all. The shallow reefs are mainly clusters or patches and are found in 20 to 30 feet of water. Those in deep water are true reefs, part of the continuous line that begins farther south at Boca Raton and extends northward to Jupiter.

The most popular of these is called the Double Ledges, in 75 to 85 feet of water. The amount of current can vary considerably from one day to the next, but it's always best to come expecting it to be strong. Not finding it so will be a very pleasant surprise. However, as the reef runs north-south and the Gulf Stream flows northward, this is a perfect arrangement for drift diving. As the Double Ledges are quite close to the Gulf Stream, the marine life can be outstanding.

Closer to shore and usually not as affected by current is the popular Breakers Reef, located in front of the famous Breakers Hotel. Because of its mild current, this is a favorite spot for newcomers. The Breakers Reef offers most of the things divers hope to see — snapper, lobster, tropical fish, morays and turtles — and it doesn't require the skill or effort needed farther offshore. There are even shallower reef spots in the same vicinity.

As for wrecks, the "Mispah" is becoming one of the best known in the country. Like many of the region's more modern wrecks, it was deliberately sunk to serve as a fish attractor, a kind of artificial reef. It has performed remarkably well and is now home for some of the largest angelfish I've ever seen. The "Mispah" however, wasn't placed at the bottom simply to provide a convenient hunting ground for spearfishermen. As a matter of fact, the wreck is a protected site and spearguns are not allowed. Therefore, the fish life can be excellent, some days rivaling what you can see in the Keys.

Inside the frame of the ship, the current flows around and over you. It's like slamming the door on a windstorm.

The "Mispah" is covered with corals, sponges and hydroids. Its deck is strewn with wreckage and the sides breached in several places. This, combined with the depth and dark blue water, sometimes results in a very eerie dive. My most memorable dive here was the time a large ray swam over us. Busy with my photography, it had not occurred to me to look up, and it was my buddy who first sighted the creature.

It moved over us in a slow, majestic manner. Spotting our air bubbles, it made a kind of banking turn as if to look at us. We must have startled it, for a moment later its wings began flapping very fast. It swam off swiftly and erratically.

Not far from the "Mispah" is a barge typical of many found up and down the coast. Because of the prolific marine life in residence, it is an excellent photography site.

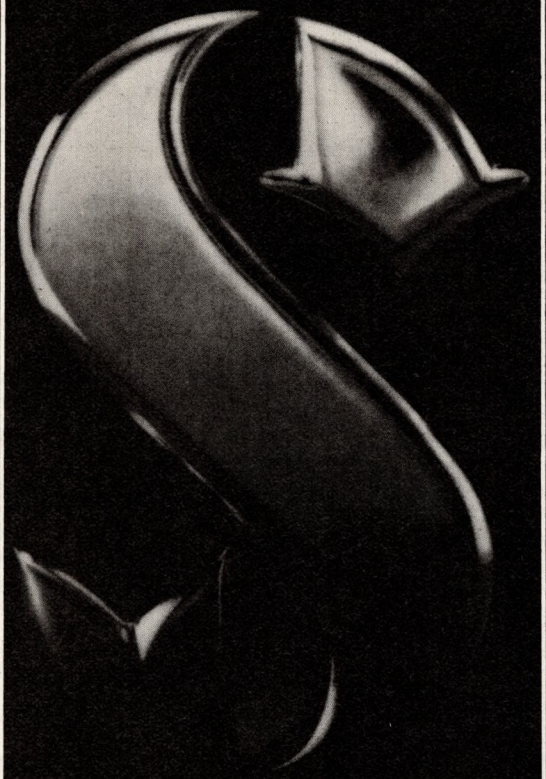
In some spots the sponge growth is so thick that fish burrow in it like rabbits. Obscured among the corals and

BENEATH THE SURFACE OF EVERY HUNTER

THE EXCITEMENT OF SCUBA DIVING

Beneath the Surface of Everyone...

BENEATH THE SURFACE OF EVERY FISHERMAN



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sponges is a common sight, the thorny oyster. This mollusk has a top shell with a brittle streamer resembling a scooped and clipped piece of saltwater taffy.

All of these dive sites are just a little more than swimming distance from the Palm Beach inlet. Two other popular resort areas are Pompano Beach and Fort Lauderdale. Both have inlets which allow dive boats easy access to the sea.

Pompano Beach reefs are characterized by ledges rising 10 to 15 feet above the sand shelf. Like those off the Palm Beaches, they are littered with colorful sponges filled with many small invertebrates. Lobstering can be quite good, particularly at night when the crustaceans are more likely to walk the reefs openly. Wrecks, too, are interesting, including several dating to the 1700s and 1800s. Of particular note is the 400-foot freighter, the "Mazon," which was recently sunk near the Hillsboro inlet at Pompano. Now called the "Lowrance" after the company that helped make it a fish attractor, it is the largest artificial reef on the Gold Coast and should shortly become one of Florida's best spots for concentrated fish life.

If you want to know just how good the diving off Fort Lauderdale is, consider this; the reefs running south between Port Everglades Inlet and Dania are being considered as the location for Florida's second underwater park. When and if so designated, the reefs would be completely protected like those at Pennekamp, exempt from spearfishing, fish traps, tropical fish collecting, dredging or removal of any artifacts deemed of historic interest. Boats will be allowed to anchor only at specific moorings or in the sand. The reef section, in essence, would become a giant playground.

Rare pillar corals, staghorn, star and brain corals are all to be found in the proposed park section at Cuda Reef and Hammerhead Reef. Many divers feel protection can't come too soon; some corals are showing some damage from dredging and pollution.

Wreck divers have some unusual options to choose from here: a houseboat, several barges and a tug boat in addition to the recently sunk "Lowrance."

One undersea delicacy that may be found almost anywhere along the Gold Coast is the stone crab, a creature visiting divers are not likely to be familiar with. The stone crab is not easy to mistake. A grey-colored denizen, it looks like a survivor from the Stone Age sporting the kind of huge claw you'd expect to find only on a Maine lobster. The claws are delicious and considered a great delicacy. If you see a stone crab, keep in mind you can't take the whole crab — they are protected by Florida law. You are permitted to remove the forearm as long as it's 2¾ inches long. Florida law is also very strict about tampering with stone crab, blue crab or lobster traps placed on the reef. It's a third degree felony offense for anyone who does.

Regarding the equally sought-after spiny lobster, their taking also is regulated. The carapace must measure three or more inches, or the tail at least 5½ inches in length. Lobster must be transported whole either below or on state waters. You can't tear the tail off legally until you're back on shore. Enforcement officials are serious about the proper lobster and stone crab dimensions; recognizing this, dive shops carry measuring devices that should be used by anyone contemplating gathering either crabs or lobster.

The list of dive shops and dive boats that serve the Gold Coast is too lengthy to run in full. Complete information on dive facilities, accommodations and all recreational opportunities is available from: Palm Beach Chamber of Commerce, P.O. Box 2931, West Palm Beach, FL 33402, (305) 833-3711; Greater Pompano Beach Chamber of Commerce, 2200 East Atlantic Blvd., Pompano Beach, FL 33062, (305) 941-2940; Fort Lauderdale/Broward Chamber of Commerce, P.O. Box 14516, Fort Lauderdale, FL 33302, (305) 462-6000.

This is one gold rush that's just beginning. **S**

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(Continued from page 35)

"yes."

It is against this backdrop that the legends of the Lake Murray Bombers begin. Fact has become embellished with fantasy and in many cases reached even greater heights by the constant retelling of each story; each teller adding to his own version one or more "pertinent" facts. Every several years someone "finds" one of the elusive B-25s. The problem then is finding the finder. Somehow he never materializes. But fact is still fact. The planes are there, but where?

Judging by its appearance today, the most popular target had to be "Lunch Island." There are still no large trees, only a few small scrub oak and pine on the island. The shore is littered with the relics of war. Shrapnel and other assorted pieces of ordnance are lying all over the place. Pieces of bombs, nose cones, tail sections and hanger brackets are common. In the mud banks can be seen complete bombs embedded where they hit over 40 years ago and now exposed by the falling away of the bank. There is so much ordnance here that most people call the place "Bomb Island."

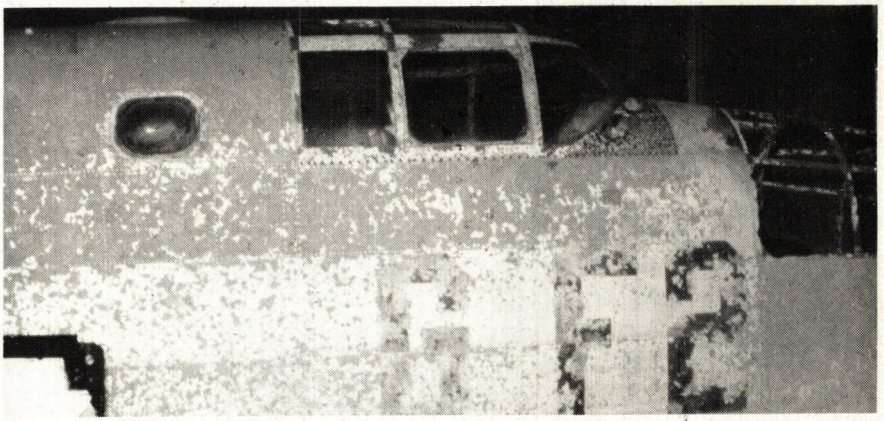
"Bomb Island" figures prominately in most, if not all, of the stories concerning the Lake Murray Bombers. It is mentioned so often that one cannot help but believe that fact lies buried in the different versions. The stories concern sightings of one or more planes about 30 years ago during an unusual drawdown of the lake by SCE&G, the power company that built and operates it. It was in the 1950s and reports are that the tail section of a B-25 was seen offshore of "Bomb Island." Admittedly, this is the kind of thing that rumors are made of but I decided to pursue it anyway.

In late 1981, I made a series of exploratory dives off the south side of "Bomb Island." The word exploratory is used loosely because no plan or search pattern really existed. I just wanted to dive the area and see what was there. It is on this side of the island that the Saluda riverbed lies. There is no question about the location of the bed. The bottom simply falls away very rapidly, beginning at about 20 or 25 feet deep and continues falling until it reaches a depth of approximately 130 feet.

I was amazed at the amount of debris littering the bottom. There are all kinds of things similar to what is on shore, just much more of it. On several occasions what I thought at first was a tree stump turned out to be a bomb sticking out of the bottom, embedded nose first. I found several shells but left them where they lay, not knowing exactly what they were. Several objects did not appear to be shrapnel or pieces of other ordnance. One in particular looked somewhat like a small metal plate only kind of a whitish color, and it had not rusted as had most of the other stuff. Other finds included lengths of cable, one or two rusted boxes and pieces of rod and pipe.

Continuing down the edge of the riverbed, the amount of war material decreased. Lake Murray is very silty and the deeper one goes, the more silt there is, so it could be that the material was hidden beneath the silt, but I don't think so. I got as deep as 100 feet on one occasion but found myself in a stand of trees left standing when the lake was created. I found nothing but it was quite an experience ascending from 100 feet, weaving my way through the tree tops!

As winter gave way to spring, I had made some interesting dives but no B-25. With the arrival of warm weather, more and more of my time on the water was spent taking the family for day-long rides in the boat. Marina operators on seeing my diving equipment, asked if I had made any dives around "Bomb Island" or had found any of the B-25s. At least two of them told me they had personally seen the reported bomber during the time the water was so low. Their stories placed the plane off the southeast side, not the south side as I had previously thought.



Although I got really excited, as soon as I looked at a topo map, my excitement faded. The southeast side also faced the riverbed. Although the depths are the same, the bottom here had several near perpendicular valleys, kind of like a roller coaster ride to the bottom of the riverbed. Two dives were made. The bottom was also littered with debris on this side, there were a lot of tree stumps and the bottom was hard to follow. On one day, visibility was less than five feet using a light. The plane could have been passed closely.

Unfortunately, there are many days when the visibility is as bad or worse. This is especially true at depth. I have seen visibility in Lake Murray exceed 20 feet at the shallower depths only to drop to zilch at a depth of 30 feet or so. There is no way to predict what the visibility will be. You just dive in and take a look.

Divers have been searching for these elusive ghosts of war for years and to my knowledge there has not yet been a documented find. But searching Lake Murray is a time consuming task. Lack of visibility, silt that is like black talcum powder when disturbed and deep water all complicate the process.

Some 60 miles west of Columbia is Greenwood, S.C. There one finds another lake formed by the damming of the Saluda River; Lake Greenwood. During the same time that the bombing runs were taking place on Lake Murray, a B-25 on a routine training mission crashed in Lake Greenwood in full view of at least a dozen people. Witnesses said the pilot simply flew too low, a wing or prop caught a wave and that was that. Fortunately all of her crew survived but the craft soon sank and came to rest on the lake bottom, 60 feet below. It would seem reasonable that with this many witnesses, divers would have no problem finding this plane, but it wasn't until 1983 when several enterprising souls using a side-scan sonar located the wreckage — intact. The plane was raised, her wings removed and the whole thing shipped to Owens Field in Columbia for storage and possible restoration.

To view her now is a remarkable experience, one that is difficult to describe. The spaces within are so small it is hard to imagine it carried a crew of seven. Peering inside the plexiglass nose one can still see the bombardier's controls. There is even a small chart that plots glide paths of the bombs depending upon the air speed of the plane. Also found onboard were several thermos jugs, still with coffee inside. The plane is just as she was 40 odd years ago.

Are there B-25s in Lake Murray? At this point, that is a matter of opinion. However, it is my belief that one day, someone will find one of these great relics of the past and in doing so will preserve for future generations far more than can be gained from photographs or the printed word. This is the stuff of high adventure, the tracking of an elusive quarry, a ghost, against great odds. One day though, one day, someone will turn the legends of the Lake Murray Bombers into fact. **S**

ONE

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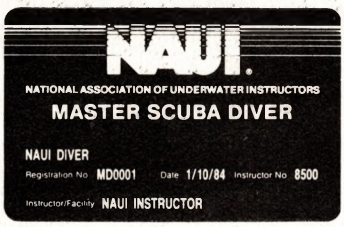

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Dixie River Dive

(Continued from page 49)

draft of 3 feet. At the time it sunk, it was carrying a load of brick. The wreck was raised and moved to Columbia a year or so ago for preservation. Although her load was only brick, some very pretty slipware bowls and cups were also recovered. It's interesting to note that while efforts to salvage this wreck were underway, the team found two more wrecks in the same vicinity. Being a ferry crossing, a number of colonial and turn-of-the-century bottles were found. While Brown's Ferry is not the only dive site on the Black, it is a productive one.

Flowing parallel to the Cooper and also emptying into the Atlantic at Charleston is the Ashley River. Even its name conjures up images of the Old South. Reportedly a Union gunboat was sunk at its mouth during the Civil War. The best sites to dive, however, are upstream where the plantations once stood. Several sites here can be dived from the shore. Last year a friend dove one of these sites and came up with a medicine bottle from the 1850s and a beer bottle from about 1900. This was in addition to approximately a half ounce of gold jewelry.

In the southeastern portion of the state are the Combahee, Edisto, Coosawhatchie, Beaufort and Ashepoo rivers. These rivers were used extensively by Union gunboats during the "Late Unpleasantness," and therefore are good sites for relics of this era. This is of course in addition to relics of colonial days and earlier.

The area from Charleston south to Hilton Head was occupied by Union forces all through the war. In fact, Hilton Head was a major supply base. In 1864 an expedition was launched from Edisto Island up the Ashepoo River. During this expedition one of the Union troop transports became lodged on a sandbar in the river. She was fired upon by Confederate shore batteries and sank. The ship was the U.S.S. Boston. In 1981, her resting place was discovered and after issuance of the proper permits, the vessel was salvaged. A number of personal items such as buttons and insignia were recovered. Even pieces of hardtack were found.

Although a lot of fun, river diving is not a sport everyone will enjoy. The limited visibility is a real drawback. Depending upon the time of year, and which river you are diving, visibility can be as little as a foot or so up to as much as 20 feet or better. Some rivers are just naturally darker than others.

Another factor is the current. These are rivers and they do flow. They are also influenced by the tides, and depending on the river, you could be faced with some rather strong currents.

Several dive shops in the state offer a nationally certified specialty course in riv-

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er diving. Wateree Dive Center in Columbia and Buddy Line Divers in Mt. Pleasant (outside of Charleston) are two. Some others may also. I highly recommend the inexperienced take this course.

If training in the formal sense of the word is not the way you want to go, then find a partner who knows what they are doing. That's not hard to do. Any local dive shop can provide the name of someone who would be more than willing to share their knowledge and some of their dive sites with you.

An experienced buddy can teach you all kinds of things. For example, it's not a bad idea to use the anchor line as the descent line for your first dive. You do this so you can firmly set the anchor in place before continuing your dive. The currents on some of the rivers can literally change direction depending on the tide, and an improperly set anchor could result in your boat leaving the area and visiting other parts of the river on its own. An experience you will never forget! Another piece of advice — Have a "boat driver." Someone really needs to stay in the boat just in case the anchor slips, the boat needs to be moved or a diver experiences some problem on the surface. Always set out a "lazy line" of at least 150 feet behind the boat. The end should be plainly marked with a large buoy. The boat driver and the lazy line give you double coverage. If you happen to miss the lazy line on surfacing, you've got someone in the boat to come pick you up.

I learned the value of these last two pearls of wisdom the hard way several years ago on one of my first river dives. I had anchored in 40 feet of water with 100 feet of anchor line. I headed down the anchor line to the anchor. The tide had turned and was starting to flow out but it didn't seem to be very strong. I swam upstream for the remainder of the dive — about 45 minutes. I should have been several hundred feet in front of my boat. When I surfaced, I was at least a hundred feet behind the boat! This was not a case of bad navigation. I had been in front of the boat when I left the bottom but the current had carried me that far downstream before I could reach the surface. This was simply a case of my own lack of judgment in estimating the current. With no lazy line and no boat driver, my partner and I spent the next several hours sitting on a narrow ledge a couple of hundred yards downstream trying to hail a ride back upstream to the boat. Lessons thus learned last a long time.

I also recommend using a buddy line. Because of the reduced visibility, entanglement or other problems is a possibility and it's nice to know someone is at the other end of the line.

If you'd like to try your hand at river diving and filling your goodie bag with all kinds of valuable fossils and artifacts, here are some places to contact for assistance. In Columbia two dive shops can arrange trips to the Cooper River. They are Wateree Dive Center, 3202 Fernandinia Road, Columbia, S.C., (803) 731-9344; Underwater Works, Boardwalk Plaza, Bush River Road, Columbia, S.C., (803) 798-3723.

In Charleston, there is The Wet Shop, 5121 Rivers Ave., Charleston Heights, S.C., (803) 744-5641; Buddy Line Divers, 1035 Hwy. 17 By-Pass, Fairmount Shopping Center, Mt. Pleasant, S.C., (803) 884-3606.

Divers Tom Yeager and Bob Tesenair examine a fossilized vertebra.

Of course these two shops can provide you with a wealth of information on rivers other than the Cooper and Ashley.

If you are traveling to the southeastern portion of the state and are interested in diving those waters, contact: Palmetto Scuba, 205 Triangle Square, Hilton Head Island, S.C. or their other store: Palmetto Scuba, Highway 21, Beaufort, S.C., (803) 681-3483, 842-3055, 524-7649.

These stores operate three charter boats and can provide information on the rivers in the area. In addition, they charter to some super wrecks in Port Royal and offshore.

There are many excellent books that can greatly add to the enjoyment of diving these rivers either by helping to identify what you have found or in adding to your appreciation of life as it was a century or so ago. Good examples are: "Kelly's Guide to Fossil Sharks," K.V. Kelley, Jr., Rt. 1, Box 913, Riverview, Florida 33569; "Fossil Vertebrates," M.C. Thomas, 22 Larkspur, Hendersonville, N.C. 28739; "Tidecraft-The Boats of Lower S.C. & Ga.," Rusty Fleetwood, Published by Coastal Historical Society, Savannah, Ga.; "Rice & Rice Planting in the S.C. Lowcountry," David Doar, Published by Charleston Museum, Charleston, S.C.; "Georgetown Rice Plantations," Alberta Morel Lachicotte, Published by The State Printing Co., Columbia, S.C.; "South Carolina River Trails," Prepared by: S.C. Dept. of Parks, Recreation & Tourism and S.C. Dept. of Wildlife & Marine Resources.

One final point before you don your tanks and hit the water. The recovery of fossils, relics or artifacts from the waters within the State of South Carolina is controlled by law. Officially this law is called, "The South Carolina Underwater Antiquities Act of 1982." The act is administered by the Institute of Archaeology and Anthropology, University of South Carolina, Columbia, S.C. As boring as all this may sound, this law has teeth to it, providing for some pretty healthy fines for those choosing to ignore it. The law requires any diver wishing to dive for fossils or relics apply for and receive a license to do same. It also requires that you file a report detailing your finds. In this way the institute is able to identify potentially historic finds such as the "Brown's Ferry Vessel." It sounds a lot more complicated than it really is, but you do need to be familiar with what you can and cannot do and have license in hand before diving any of the rivers. It's a simple matter even for someone out of state to obtain a license. Simply contact the institute for details.

Diving a South Carolina lowcountry river offers a unique opportunity to experience history in a way that no museum or book can offer. It's intensely personal and richly rewarding. You are able to literally reach out and recapture the past. **S**

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